

Science Background:

Ozone and changes in biologically active UV radiation reaching the Earth's surface

Compiled by Robert C. Worrest

- ACIA. (2004). *Impacts of a warming Arctic: Arctic Climate Impact Assessment*. Cambridge, UK: Cambridge University Press.
- Ahmad, Z., Bhartia, P. K., & Krotkov, N. (2004). Spectral properties of backscattered UV radiation in cloudy atmospheres. *Journal of Geophysical Research*, *109*, D01201. doi: 10.1029/2003JD003395
- Ajtic, J., Connor, B. J., Randall, C. E., Lawrence, B. N., Bodeker, G. E., & Heuff, D. N. (2003). Antarctic air over New Zealand following vortex breakdown in 1998. *Annales Geophysicae*, *21*(11), 2175-2183. doi: 10.5194/angeo-21-2175-2003
- Albritton, D. L., & Monastersky, R. (1992). Our ozone shield: Reports to the nation on our changing planet.
- Allen, M., & McKenzie, R. (2005). Enhanced UV exposure on a ski-field compared with exposures at sea level. *Photochemical & Photobiological Sciences*, *4*(5), 429-437.
- Alpert, P., & Kishcha, P. (2008). Quantification of the effect of urbanization on solar dimming. *Geophysical Research Letters*, *35*, L08801. doi: 10.1029/2007GL033012
- Alternative Fluorocarbon Environmental Acceptability Study (AFEAS). (1992). Relative contributions of greenhouse gas emissions to climate forcing. In A. F. E. A. S. (AFEAS) (Ed.).
- Alternative Fluorocarbon Environmental Acceptability Study (AFEAS). (1993). Production, sales and atmospheric release of fluorocarbons through 1992 *Alternative Fluorocarbon Environmental Acceptability Study*. Washington, DC.
- Andersen, S. B., Weatherhead, E. C., Stevermer, A., Austin, J., Bruhl, C., Fleming, E. L., . . . Xia, J. (2006). Comparison of recent modeled and observed trends in total column ozone. *Journal of Geophysical Research*, *111*, D02303. doi: 10.1029/2005JD006091
- Anderson, J. G., Brune, W. H., & Proffitt, M. H. (1989). Ozone destruction by chlorine radicals within the Antarctic vortex: The spatial and temporal evolution of ClO-O₃ anticorrelation based on in situ ER-2 data. *Journal of Geophysical Research*, *94*(D9), 11465-11479.
- Angell, J. K., & Free, M. (2009). Ground-based observations of the slowdown in ozone decline and onset of ozone increase. *Journal of Geophysical Research*, *114*(D7), D07303. doi: 10.1029/2008JD010860
- Anton, M., Cancillo, M. L., Serrano, A., Vaquero, J. M., & Garcia, J. A. (2007). Ozone mini-hole over southwestern Spain during January 2004: Influence over ultraviolet radiation. *Geophysical Research Letters*, *34*(L10808). doi: 10.1029/2007GL029689
- Arola, A., Kazadzis, S., Krotkov, N., Bais, A., Gröbner, J., & Herman, J. R. (2005). Assessment of TOMS UV bias due to absorbing aerosols. *Journal of Geophysical Research*, *110*, D23211. doi: 10.1029/2005JD005913
- Arola, A., Kazadzis, S., Lindfors, A., Krotkov, N., Kujanpää, J., Tamminen, J., . . . Kinne, S. (2009). A new approach to correct for absorbing aerosols in OMI UV. *Geophysical Research Letters*, *36*(22), L22805
- Arola, A., & Koskela, T. (2004). On the sources of bias in aerosol optical depth retrieval in the UV range. *Journal of Geophysical Research*, *109*, D08209. doi: 10.1029/2003JD004375
- Arola, A., Lakkala, K., Bais, A., Kaurola, J., Meleti, C., & Taalas, P. (2003). Factors affecting short and long term changes of spectral UV irradiance at two European stations. *Journal of Geophysical Research*, *108*(D17), 4549. doi: 10.1029/2003JD003447
- Bais, A. F., Kazantzidis, A., Kazadzis, S., Balis, D. S., Zerefos, C. S., & Meleti, C. (2005). Deriving an effective aerosol single scattering albedo from spectral surface UV irradiance measurements. *Atmospheric Environment*, *39*(6), 1093-1102. doi: 10.1016/j.atmosenv.2004.09.080
- Baldwin, M. P., Dameris, M., & Shepherd, T. G. (2007). How Will the Stratosphere Affect Climate Change? *Science*, *316*(5831), 1576-1577. doi: 10.1126/science.1144303

- Baldwin, M. P., Stephenson, D. B., Thompson, D. W. J., Dunkerton, T. J., Charlton, A. J., & O'Neill, A. (2003). Stratospheric memory and skill of extended-range weather forecasts. *Science*, *301*(5633), 636-640. doi: 10.1126/science.1087143
- Balis, D. S., Amiridis, V., Zerefos, C., Kazantzidis, A., Kazadzis, S., Bais, A. F., . . . Andreae, M. O. (2004). Study of the effect of different type of aerosols on UV-B radiation from measurements during EARLINET. *Atmospheric Chemistry and Physics*, *4*(2), 307-321. doi: 10.5194/acp-4-307-2004
- Banaszak, A. T., & Neale, P. J. (2001). Ultraviolet radiation sensitivity of photosynthesis in phytoplankton from an estuarine environment. *Limnology and Oceanography*, *46*(3), 592-603.
- Barnard, W. F., Saxena, V. K., Carolina, N., Wenny, B. N., & DeLuise, J. J. (2003). Daily surface UV exposure and Its relationship to surface pollutant measurements. *Journal of the Air & Waste Management Association*, *53*(2), 237-245.
- Barrie, L. A., Borrell, P., & Langen, J. (2004). *The changing atmosphere. An integrated global atmospheric chemistry observation theme for the IGOS partnership. Report of the Integrated Global Atmospheric Chemistry Observation Theme Team*. Geneva: WMO.
- Bath-Hextall, F., Leonardi-Bee, J., Smith, C., Meal, A., & Hubbard, R. (2007). Trends in incidence of skin basal cell carcinoma. Additional evidence from a UK primary care database study. *International Journal of Cancer*, *121*(9), 2105-2108. doi: 10.1002/ijc.22952
- Beerling, D. J., Gardiner, T., Leggett, G., McLeod, A. R., & Quick, W. P. (2008). Missing methane emissions from leaves of terrestrial plants. *Global Change Biology*, *14*(8), 1821-1826. doi: 10.1111/j.1365-2486.2008.01607.x
- Benedick, R. E. (1991). *Ozone diplomacy: New directions in safeguarding the planet*. Cambridge, Massachusetts: Harvard University Press.
- Berger, D. S. (1976). The sunburning ultraviolet meter: design and performance. *Photochemistry & Photobiology*, *24*(6), 587-593. doi: 10.1111/j.1751-1097.1976.tb06877.x
- Berger, D. S., & Urbach, F. (1982). A Climatology of Sunburning Ultraviolet Radiation *Photochemistry and Photobiology*, *35*(2), 187-192. doi: 10.1111/j.1751-1097.1982.tb03830.x
- Bergstrom, R. W., Pilewskie, P., Pommier, J., Rabbette, M., Russell, P. B., Schmid, B., . . . Quinn, P. K. (2004). Spectral absorption of solar radiation by aerosols during ACE-Asia. *Journal of Geophysical Research*, *109*(D19S15), D19S15. doi: 10.1029/2003JD004467
- Berner, R. A. (2006). GEOCARBSULF: A combined model for Phanerozoic atmospheric O₂ and CO₂. *Geochimica et Cosmochimica Acta*, *70*(23). doi: 10.1016/j.gca.2005.11.032
- Berner, R. A., VandenBrooks, J. M., & Ward, P. D. (2007). Oxygen and Evolution. *Science*, *316*(5824), 557-558. doi: 10.1126/science.1140273
- Bernhard, G., Booth, C. R., & Ebrahimian, J. C. (2004). Version 2 data of the National Science Foundation's Ultraviolet Radiation Monitoring Network: South Pole. *Journal of Geophysical Research*, *109*(D21), D21207.21201-D21207.21218.
- Bernhard, G., Booth, C. R., & Ebrahimian, J. C. (2008). Comparison of UV irradiance measurements at Summit, Greenland; Barrow, Alaska; and South Pole, Antarctica. *Atmospheric Chemistry and Physics*, *8*(16), 4799-4810. doi: 10.5194/acp-8-4799-2008
- Bernhard, G., Booth, C. R., & Ebrahimian, J. C. (2010). Climatology of ultraviolet radiation at high latitudes derived from measurements of the National Science Foundation's spectral irradiance monitoring network. In W. Gao, D. L. Schmoldt & J. R. Slusser (Eds.), *UV Radiation in Global Change: Measurements, Modeling and Effects on Ecosystems* (pp. 544): Tsinghua University Press, Beijing and Springer, New York.
- Bernhard, G., Booth, C. R., Ebrahimian, J. C., & Nichol, S. E. (2006). UV climatology at McMurdo Station, Antarctica, based on version 2 data of the National Science Foundation's Ultraviolet Radiation Monitoring Network. *Journal of Geophysical Research*, *111*, D11201. doi: 10.1029/2005JD005857
- Betts, R. A., Boucher, O., Collins, M., Cox, P. M., Falloon, P. D., Gedney, N., . . . Webb, M. J. (2007). Projected

- increase in continental runoff due to plant responses to increasing carbon dioxide. *Nature*, 448, 1037-1041. doi: 10.1038/nature06045
- Bhartia, P. K., McPeters, R., Stolarski, R., Flynn, L. E., & Wellemeyer, C. G. (2004, 2004). *A quarter century of ozone observations by SBUV and TOMS*. Paper presented at the XX Quadrennial Ozone Symposium, Kos.
- Bill, M., Conrad, M. E., & Goldstein, A. H. (2004). Stable carbon isotope composition of atmospheric methyl bromide. *Geophysical Research Letters*, 31, L04109. doi: 10.1029/2003GL018639
- Björn, L. O., & McKenzie, R. L. (2007). Attempts to probe the ozone layer and the UV-B levels of the past. *Ambio*, 36(5), 366-371. doi: 10.1579/0044-7447(2007)36[366:ATPTOL]2.0.CO;2
- Blokker, P., Yeloff, D., Boelen, P., Broekman, R. A., & Rozema, J. (2005). Development of a proxy for past surface UV-B irradiation: A thermally assisted hydrolysis and methylation py-GC/MS method for the analysis of pollen and spores. *Analytical Chemistry*, 77(18), 6026-6031. doi: 10.1021/ac050696k
- Bolsee, D., A.R.Webb, Gillotay, D., Dorschel, B., Knuschke, P., Krins, A., & I.Terenetskaya. (2000). Laboratory facilities and recommendations for the characterization of biological ultraviolet dosimeters. *Applied Optics*, 39(2813-2822).
- Borkowski, J. L. (2008). Modelling of UV radiation variations at different time scales. *Annals of Geophysics*, 26, 441-446.
- Boucher, N. P., & Prézelin, B. B. (1996). An in situ biological weighting function for UV inhibition of phytoplankton carbon fixation in the Southern Ocean. *Marine Ecology-Progress Series*, 144, 223-236.
- Boucher, N. P., & Prézelin, B. B. (1996). Spectral modeling of UV inhibition of In Situ Antarctic primary production using a field-derived biological weighting function. *Photochemistry and Photobiology*, 64(3), 407-418.
- Bouillon, R., Eisman, J., Garabedian, M., Holick, M., Kleinschmidt, J., Suda, T., . . . Webb, A. (2006). Action spectrum for the production of previtamin D3 in human skin (Vol. 174:2006). Vienna: Commission Internationale de L'Eclairage (CIE).
- Brand, S., Dethloff, K., & Handorf, D. (2008). Tropospheric circulation sensitivity to an interactive stratospheric ozone. *Geophysical Research Letters*, 35, L05809. doi: 10.1029/2007GL032312
- Brandt, L. A., King, J. Y., & Milchunas, D. G. (2007). Effects of ultraviolet radiation on litter decomposition depend on precipitation and litter chemistry in a shortgrass steppe ecosystem. *Global Change Biology*, 13, 2193-2205.
- Briffa, K. R., Osborn, T. J., & Schweingruber, F. H. (2004). Large-scale temperature inferences from tree rings: a review. *Global and Planetary Change*, 40, 11-26.
- Brogniez, C., Buchard, V., & Auriol, F. (2008). Validation of UV-visible aerosol optical thickness retrieved from spectroradiometer measurements. *Atmospheric Chemistry and Physics*, 8(16 Special Issue), 4655-4663. doi: 10.5194/acp-8-4655-2008
- Brönnimann, S., Luterbacher, J., Staehelin, J., & Svendby, T. M. (2004). An extreme anomaly in stratospheric ozone over Europe in 1940-1942. *Geophysical Research Letters*, 31(L08101), DOI:10.1029/2004GL019611.
- Brönnimann, S., Staehelin, J., Farmer, S. F. G., Cain, J. C., Svendby, T., & Svenoe, T. (2003). Total ozone observations prior to the IGY. I: A history. *Quarterly Journal of the Royal Meteorological Society*, 129(593), 2797-2817.
- Brönnimann, S., Vogler, C., Staehelin, J., Stolarski, R., & Hansen, G. (2008). Total ozone observations during the past 80 years. In S. Brönnimann, J. Luterbacher, T. Ewen, H. Diaz, R. Stolarski & U. Neu (Eds.), *Climate Variability and Extremes during the Past 100 Years* (pp. 129-140). Netherlands: Springer.
- Brune, W. H., Turco, R., Matthews, W. A., Douglass, A., Prendez, M., Subbaraya, B. H., . . . O'Neill, A. (1992). Stratospheric processes: Observations and interpretation *Chapter 4 in Scientific assessment of*

- ozone: *Depletion 1991* (Vol. Report no. 25).
- Budyko, M. I. (1977 (translation)). *Climatic changes*. Washington DC: American Geophysical Society.
- Butler, J. H., King, D. B., Lobert, J. M., Montzka, S. A., Yvon-Lewis, S. A., Hall, B. D., . . . Elkins, J. W. (2007). Oceanic distributions and emissions of short-lived halocarbons. *Global Biogeochemical Cycles*, *21*, GB1023.
- Calbo, J., Pages, D., & Gonzalez, J. (2005). Empirical studies of cloud effects on UV radiation: A review. *Rev. Geophys.*, *43*.
- Caldwell, M. M., F, B. J., Ballaré, C. L., Flint, S. D., & Kulandaivelu, G. (2007). Terrestrial ecosystems, increased solar ultraviolet radiation and interactions with other climate change factors. *Photochem. Photobiol. Sci.*, ???, ???
- Canfield, D. E. (2005). The early history of atmospheric oxygen: Homage to Robert M. Garrels. *Annual Review of Earth and Planetary Sciences*, *33*, 1-36. doi: 10.1146/annurev.earth.33.092203.122711
- Caputo, C., Rutitzky, M., & Ballaré, C. L. (2006). Solar ultraviolet-B radiation alters the attractiveness of *Arabidopsis* plants to diamondback moths (*Plutella xylostella* L.): impacts on oviposition and involvement of the jasmonic acid pathway. *Oecologia*, *149*, 81-90.
- Cariolle, D., Evans, M. J., Chipperfield, M. P., Butkovskaya, N., Kukui, A., & Le Bras, G. (2008). Impact of the new HNO₃-forming channel of the HO₂+NO reaction on tropospheric HNO₃, NO_x, HO_x and ozone. *Atmospheric Chemistry and Physics*, *8*, 4061-4068.
- Carpenter, L. J., Wevill, D. J., Palmer, C. J., & Michels, J. (2007). Depth profiles of volatile iodine and bromine-containing halocarbons in coastal Antarctic waters. *Marine Chemistry*, *103*, 227-236.
- Catling, D. C., & Claire, M. W. (2005). How Earth's atmosphere evolved to an oxic state: A status report. *Earth and Planetary Science Letters*, *237*, 1–20.
- CCMVal, S. (2010). SPARC CCMVal Report on the Evaluation of Chemistry-Climate Models. In V. Eyring, T. G. Shepherd & D. W. Waugh (Eds.).
- Cede, A., Blumthaler, M., Luccini, E., Piacentini, R. D., & Nunez, L. (2002). Effects of clouds on erythemal and total irradiance as derived from data of the Argentine Network. *Geophysical Research Letters*, *29*(24), 2223, DOI:2210.1029/2002GL015708.
- Cede, A., Herman, J. R., Richter, A., Krotkov, N. A., & Burrows, J. (2005). Measurements of nitrogen dioxide total column amounts at Goddard Space Flight Center using a Brewer spectrometer in direct sun mode. *Journal of Geophysical Research*, *111*(D05304), DOI:10.1029/2005JD006585.
- Cede, A., Luccini, E., Nunez, L., Piacentini, R. D., Blumthaler, M., & Herman, J. (2004). TOMS-derived erythemal irradiance versus measurements at the stations of the Argentine UV Monitoring Network. *Journal of Geophysical Research*, *109*(D8), D08109 08110.01029/02004JD004519.
- Centers for Disease Control. (2007). Sunburn prevalence among adults - United States, 1999, 2003, and 2004. *Morbidity and Mortality Weekly Report*, *56*, 524-528. doi: mm5621a2 [pii]
- Chameides, W. L., Fehsenfeld, F., Rodgers, M. O., Cardelino, C., Martinez, J., Parrish, D., . . . Wang, T. (1992). Ozone precursor relationships in the ambient atmosphere. *Journal of Geophysical Research*, *97* (D5), 6037-6055.
- Charlson, R. J., Lovelock, J. E., Andreae, M. O., & Warren, S. G. (1987). Oceanic phytoplankton, atmospheric sulphur, cloud albedo and climate. *Nature*, *326*, 655-661.
- Cheyamol, A., & De Backer, H. (2003). Retrieval of the aerosol optical depth in the UV-B at Uccle from Brewer ozone measurements over a long time period 1984-2002. *Journal of Geophysical Research*, *108*(D24), 4800, DOI:4810.1029/2003JD003758.
- Chipperfield, M. (2009). Nitrous oxide delays ozone recovery. *Nature Geoscience*, *2*(Nov), 742-743.
- Chubarova, N. (2008). UV variability in Moscow according to long-term UV measurements and reconstruction model. *Atmospheric Chemistry and Physics*, *8*, 3025–3031.
- Chubarova, N. E. (2004). Influence of aerosol and atmospheric gases on ultraviolet radiation in different optical conditions including smoky mist of 2002. *Doklady Earth Sciences*, *394*(1), 62–67.

- Chubarova, N. E. (2006). Role of tropospheric gases in the absorption of UV radiation. *Doklady Earth Sciences*, 407(2), 294–297.
- Chubarova, N. Y., Larin, I. K., Lebedev, V. V., V.S.Partola, Lezina, Y. A., & Rublev, A. N. (2008). *Experimental and Model Study of Changes in Spectral Solar Irradiance in the Atmosphere of Large City due to Tropospheric NO₂ Content*. Paper presented at the Current Problems in Atmospheric Radiation, International Radiation Symposium, Iguazu, Brazil.
- Chubarova, N. Y., Nezval, Y. I., Verdebout, J., Krotkov, N., & Herman, J. (2005). Long-term UV irradiance changes over Moscow and comparisons with UV estimates from TOMS and METEOSAT (SPIE, Trans.). In G. Bernhard, J. R. Slusser, J. R. Herman & W. Gao (Eds.), *Ultraviolet Ground- and Space-based Measurements, Models, and Effects V* (Vol. 5886, pp. 63-73). San Diego: SPIE.
- Crossen, I., Sanz-Forcada, J., Favata, F., Witasse, O., Zegers, T., & Arnold, N. F. (2007). Habitat of early life: Solar X-ray and UV radiation at Earth's surface 4–3.5 billion years ago. *Journal of Geophysical Research*, 112(E02008), doi:10.1029/2006JE002784.
- Comiso, J. C., Parkinson, C. L., Gersten, R., & Stock, L. (2008). Accelerated decline in the Arctic sea ice cover. *Geophysical Research Letters*, 35(L01703), doi:10.1029/2007GL031972.
- Coups, E. J., Manne, S. L., & Heckman, C. J. (2008). Multiple skin cancer risk behaviors in the U.S. population. *American Journal of Preventative Medicine*, 34(2), 87-93. doi: S0749-3797(07)00655-1 [pii]
10.1016/j.amepre.2007.09.032 [doi]
- Cox, M. L., Sturrock, G. A., Fraser, P. J., Siems, S. T., & Krummel, P. B. (2005). Pages: Identification of regional sources of methyl bromide and methyl iodide from AGAGE observations at Cape Grim, Tasmania. *Journal of Atmospheric Chemistry*, 50(1), 59 - 77.
- Crawford, J., Shetter, R. E., Lefer, B., Cantrell, C., Junkermann, W., Madronich, S., & Calvert, J. (2003). Cloud impacts on UV spectral actinic flux observed during the International Photolysis Frequency Measurement and Model Intercomparison (IPMMI). *Journal of Geophysical Research*, 108(D14), 8545, DOI:8510.1029/2002JD002731.
- Crook, J. A., Gillett, N. P., & Keeley, S. P. E. (2008). Sensitivity of Southern Hemisphere climate to zonal asymmetry in ozone. *Geophysical Research Letters*, 35(L07806), doi:10.1029/2007GL032698.
- Cropp, R., Norbury, J., & Braddock, R. (2007). Dimethylsulphide, clouds, and phytoplankton: Insights from a simple plankton ecosystem feedback model. *Global Biogeochemical Cycles*, 21, GB2024. doi: 10.1029/2006GB002812
- Crowley, J. N., & Carl, S. A. (1997). OH formation in the photoexcitation of NO₂ beyond the dissociation threshold in the presence of water vapor. *Journal of Physical Chemistry A*, 101, 4178-4184.
- Crutzen, P. J. (2006). Albedo enhancement by stratospheric sulfur injections: A contribution to resolve a policy dilemma? *Climatic Change*, 77, 211-220 doi: 210.1007/S10584-10006-19101-y12006.
- Cullen, J. J., & Neale, P. J. (1997). Effects of UV on short-term photosynthesis of natural phytoplankton. *Photochemistry and Photobiology*, 65, 264-266.
- Cullen, J. J., Neale, P. J., & Lesser, M. P. (1992). Biological weighting function for the inhibition of phytoplankton photosynthesis by ultraviolet radiation. *Science*, 258(5082), 646-650.
- Dahlback, A., Gelsor, N., Stamnes, J., & Gjessing, Y. (2007). UV measurements in the 3000-5000 m altitude region in Tibet. *Journal of Geophysical Research - Atmospheres*, 112(D09308), doi: 1029/2006jd007700.
- Dal, H., Boldemann, C., & Lindelof, B. (2008). Trends during a half century in relative squamous cell carcinoma distribution by body site in the Swedish population: support for accumulated sun exposure as the main risk factor. *Journal of Dermatology*, 35, 55-62. doi: JDE416 [pii]
10.1111/j.1346-8138.2008.00416.x [doi]
- Dameris, M., Matthes, S., Deckert, R., Grewe, V., & Ponater, M. (2006). Solar cycle effect delays onset of ozone recovery. *Geophysical Research Letters*, 33(L03806), DOI:10.1029/2005GL024741.

- Daniel, J. S., Velders, G. J. M., Solomon, S., McFarland, M., & Montzka, S. A. (2007). Present and future sources and emissions of halocarbons: Toward new constraints. *Journal of Geophysical Research*, *112*(D02301), doi:10.1029/2006JD007275.
- de F. Forster, P. M., & Joshi, M. J. (2005). The role of halocarbons in the climate change of the troposphere and stratosphere. *Climatic Change*, *71*, 249–266. doi: 10.1007/s10584-005-5955-7
- de Graaf, M., Stammes, P., Torres, O., & Koelemeijer, R. B. A. (2005). Absorbing aerosol index: Sensitivity analysis, application to GOME and comparison with TOMS. *Journal of Geophysical Research*, *110*(D01201), DOI:10.1029/2004JD005178.
- De Gruijl, F. R., & Van der Leun, J. C. (1994). Estimate of the wavelength dependency of ultraviolet carcinogenesis in humans and its relevance to the risk assessment of stratospheric ozone depletion. *Health Physics*, *67*, 319-325.
- De Leeuw, S., Janssen, S., Simons, J. W. I. M., Lohman, P. H. M., Vermeer, B.-J., & Schothorst, A. A. (1994). The UV action spectra for the clone-forming ability of cultured human melanocytes and keratinocytes. *Photochemistry and Photobiology*, *59*(4), 430-436.
- Deckert, R., & Dameris, M. (2008). Higher tropical SSTs strengthen the tropical upwelling via deep convection. *Geophysical Research Letters*, *35*(L10813), doi:10.1029/2008GL033719.
- del Valle, D. A., Kieber, D. J., Bisgrove, J., & Kiene, R. P. (2007). Light-stimulated production of dissolved DMSO by a particle-associated process in the Ross Sea, Antarctica. *Limnology and Oceanography*, *52*, 2456-2466.
- den Outer, P., Slaper, H., Kaurola, J., Lindfors, A., Kazantzidis, A., Bais, A., . . . Josefsson, W. (2010). Reconstructing of erythemal ultraviolet radiation levels in Europe for the past 4 decades. *Journal of Geophysical Research - Atmospheres*, doi:10.1029/2009JD012827.
- den Outer, P. N., Slaper, H., & Tax, R. B. (2005). UV radiation in the Netherlands: Assessing long-term variability and trends in relation to ozone and clouds. *Journal of Geophysical Research*, *110*(D02203), DOI:10.1029/2004JD004824.
- Diffey, B. (2005). Do white British children and adolescents get enough sunlight? *British Medical Journal*, *331*(331), 3-4. doi: 10.1136/bmj.331.7507.3
- Diffey, B. (2008). A behavioral model for estimating population exposure to solar ultraviolet radiation. *Photochemistry and Photobiology*, *84*, 371.
- Diffey, B. L. (2002). Human exposure to solar ultraviolet radiation. *Journal of Cosmetic Dermatology*, *1*(3), 124-130.
- Diffey, B. L., Jansén, C. T., Urbach, F., & Wulf, H. C. (1997). The Standard Erythema Dose: a new photobiological concept. *Photodermatology, Photoimmunology and Photomedicine*, *13*, 64-66.
- Dong, X. Q., Xi, B. K., & Minnis, P. (2006). Observational evidence of changes in water vapor, clouds, and radiation at the ARM SGP site. *Geophysical Research Letters*, *33*(L19818), doi:10.1029/2006GL027132.
- Dueck, T., & van der Werf, A. (2008). Are plants precursors for methane? *New Phytologist*, *178*, 693-695.
- Dueck, T. A., de Visser, R., Poorter, H., Persijn, S., Gorissen, A., de Visser, W., . . . van der Werf, A. (2007). No evidence for substantial aerobic methane emission by terrestrial plants: a C-13-labelling approach. *New Phytologist*, *175*, 29-35.
- Eguchi, N., & Yokota, T. (2008). Investigation of clear-sky occurrence rate estimated from CALIOP and MODIS observations. *Geophysical Research Letters*, *35*(L23816), 10.1029/2008GL035897.
- Elkins, J. W., Thompson, T. M., Swanson, T. H., Butler, J. H., Hall, B. D., Cummings, S. O., . . . Raffo, A. G. (1993). Decrease in the growth rates of atmospheric chlorofluorocarbons 11 and 12. *Nature*, *364*, 780-783.
- Engelsen, O., Hansen, G. H., & Svenoe, T. (2004). Long-term (1936-2003) ultraviolet and photosynthetically active radiation doses at a north Norwegian location in spring on the basis of total ozone and cloud cover. *Geophysical Research Letters*, *31*(L12103), DOI:10.1029/2003GL019241.

- Erlandsson, M., Buffam, I., Folster, J., Laudon, H., Temnerud, J., Weyhenmeyer, G. A., & Bishop, K. (2008). Thirty-five years of synchrony in the organic matter concentrations of Swedish rivers explained by variation in flow and sulphate. *Global Change Biology*, *14*, 1191-1198. doi: 10.1111/j.1365-2486.2008.01551.x
- Evans, J. R. (2007). Resolving methane fluxes. *New Phytologist*, *175*, 1-4.
- Eyring, V., Chipperfield, M. P., Giorgetta, M. A., Kinnison, D. E., Manzini, E., Matthes, K., . . . , D. W. W. (2008). Overview of the New CCMVal Reference and Sensitivity Simulations in Support of Upcoming Ozone and Climate Assessments and the Planned SPARC CCMVal Report. *SPARC Newsletter*, *30*, 20-26.
- Fabry, V. J., Seibel, B. A., Feely, R. A., & Orr, J. C. (2008). Impacts of ocean acidification on marine fauna and ecosystem processes. *ICES Journal of Marine Science*, *65*, 414-432.
- Farman, J. C., Gardiner, B. G., & Shanklin, J. D. (1985). Large losses of total ozone in Antarctica reveal seasonal ClO_x/NO_x interaction. *Nature*, *315*, 207-210.
- Feister, U., Junk, J., Woldt, M., Bais, A., Helbig, A., Janouch, M., . . . Slaper, H. (2008). Long-term solar UV radiation reconstructed by ANN modelling with emphasis on spatial characteristics of input data. *Atmospheric Chemistry and Physics*, *8*, 3107-3118.
- Fioletov, V., Kimlin, M., Krotkov, N., McArthur, B., Kerr, J., Wardle, D., . . . Kaurola, J. (2004). UV index climatology over North America from ground-based and satellite estimates. *Journal of Geophysical Research*, *109*(D22308). doi: 10.1029/2004JD004820
- Fioletov, V. E., McArthur, L. J. B., Mathews, T. W., & Marrett, L. (2009). On the relationship between erythemal and vitamin D action spectrum weighted Ultraviolet radiation. *Journal of Photochemistry and Photobiology B: Biology*, 10.1016/j.jphotobiol.2008.1011.1014. doi: 10.1016/j.jphotobiol.2008.11.014
- Fioletov, V. E., & Shepherd, T. G. (2003). Seasonal persistence of midlatitude total ozone anomalies. *Geophysical Research Letters*, *30*(7), 1417, DOI:1410.1029/2002GL016739.
- Fischer, S. K., Hughes, P. J., Fairchild, P. D., Kusik, C. L., Dieckmann, J. T., McMahon, E. M., & Hobday, N. (1991). Energy and global warming impacts of CFC alternative technologies, executive summary. Washington, DC.
- Fisher, D. A., Hales, C. H., Filkin, D. L., Ko, M. K. W., Sze, N. D., Connell, P. S., . . . Stordal, F. (1990). Model calculations of the relative effects of CFCs and their replacements on stratospheric ozone. *Nature*, *344*, 508-612.
- Flint, S. D., & Caldwell, M. M. (2003). A biological spectral weighting function for ozone depletion research with higher plants. *Physiologia Plantarum*, *117*, 137-144.
- Foggo, A., Higgins, S., Wargent, J. J., & Coleman, R. A. (2007). Tri-trophic consequences of UV-B exposure: plants, herbivores and parasitoids. *Oecologia*, *154*, 505-512.
- Forster, P. M., Bodeker, G. E., Schofield, R., Solomon, S., & Thompson, D. W. J. (2007). Effects of ozone cooling in the tropical lower stratosphere and upper troposphere. *Geophysical Research Letters*, *34*(L23813), doi:10.1029/2007GL031994.
- Foster, C. B., & Afonin, S. A. (2005). Abnormal pollen grains: an outcome of deteriorating atmospheric conditions around the Permian-Triassic boundary. *Journal of the Geological Society (London)*, *162*, 653-659.
- Fraser, P., Penkett, S., Harriss, R., Makide, Y., & Sanhueza, E. (1992). Source gases: Concentrations, emissions, and trends *Scientific assessment of ozone depletion: 1991* (Vol. World Meteorological Organization Global Ozone Research and Monitoring Project--Report no. 25.). Geneva: World Meteorological Organization.
- Fröhlich, C., & Lean, J. (2004). Solar radiative output and its variability: evidence and mechanisms. *The Astronomy and Astrophysics Review*, *12*, 273-320, DOI:210.1007/s00159-00004-00024-00151.
- Fromm, M., R. Bevilacqua, Servranckx, R., Rosen, J., Thayer, J. P., Herman, J., & Larko, D. (2005).

- Pyro-cumulonimbus injection of smoke to the stratosphere: Observations and impact of a super blowup in northwestern Canada on 3-4 August 1998. *Journal of Geophysical Research*, 110(D08205), DOI: 10.1029/2004JD005350.
- Gadhavi, H., Pinker, R. T., & Laszlo, I. (2008). Estimates of surface ultraviolet radiation over north America using Geostationary Operational Environmental Satellites observations. *Journal of Geophysical Research*, 113(D21205), doi:10.1029/2007JD009308.
- Garane, K., Bais, A. F., Tourpali, K., Meleti, C., Zerefos, C. S., & Kazadzis, S. (2005). *Variability of spectral UV irradiance at Thessaloniki, Greece, from 15 years measurements*. Paper presented at the Ultraviolet Ground- and Space-based Measurements, Models, and Effects V, San Diego, USA.
- Gardner, G., Lin, C., Tobin, E. M., Loehrer, H., & Brinkman, D. (2009). Photobiological properties of the inhibition of etiolated *Arabidopsis* seedling growth by ultraviolet-B irradiation. *Plant, Cell & Environment*, 32, 1573-1583. doi: 10.1111/j.1365-3040.2009.02021.x
- Gies, P., Roy, C., Javorniczky, J., Henderson, S., Lemus-Deschamps, L., & Driscoll, C. (2004). Global solar UV index: Australian measurements, forecasts and comparison with the UK. *Photochemistry and Photobiology*, 79(1), 32-39.
- Gies, P., Watz, R., Javorniczky, J., Roy, C., Henderson, S., Ayton, J., & Kingston, M. (2009). Measurements of the UVR exposures of expeditioners on Antarctic resupply voyages. *Photochemistry and Photobiology*, 85, 1485-1490.
- Gillett, N. P., & Thompson, D. W. J. (2003). Simulation of recent Southern Hemisphere climate change. *Science*, 302(5643), 273-275.
- Glandorf, M., Arola, A., Bais, A., & Seckmeyer, G. (2005). Possibilities to detect trends in spectral UV irradiance. *Theoretical and Applied Climatology*, 81, 33-44. doi: 10.1007/s00704-004-0109-9
- Gleason, J. F., Bhartia, P. K., Herman, J. R., McPeters, R., Newman, P., Stolarski, R. S., . . . Planet, W. (1993). Record low global ozone in 1992. *Science*, 260, 523-526.
- Godar, D. E. (2005). UV Doses Worldwide. *Photochemistry and Photobiology*, 81(4), 736-749.
- Goering, C. D., L'Ecuyer, T. S., Stephens, G. L., Slusser, J. R., Scott, G., Davis, J., . . . Madronich, S. (2005). Simultaneous retrievals of column ozone and aerosol optical properties from direct and diffuse solar irradiance measurements. *Journal of Geophysical Research*, 110(D05204), DOI:10.1029/2004JD005330.
- Gorbarenko, E. V., Yerokhina, E., & Lukin, A. B. (2006). Long-Period changes in Aerosol Optical Thickness of the Atmosphere in Russia. *Russian Meteorology and Hydrology*, 7, 25-31.
- Graversen, R. G., & Christiansen, B. (2003). Downward propagation from the stratosphere to the troposphere: A comparison of the two hemispheres. *Journal of Geophysical Research*, 108((D24): 4780), DOI:4710.1029/2003JD004077.
- Griffin, R. E. M. (2005). The detection and measurement of telluric ozone from stellar spectra. *Publications of the Astronomical Society of the Pacific*, 117(834), 885-894.
- Griffin, R. E. M. (2006). Detection and measurement of total ozone from stellar spectra: Paper 2. Historic data from 1935-42. *Atmospheric Chemistry and Physics*, 6, 2231-2240.
- Griffin, R. E. M., Fioletov, V., & McConnell, J. C. (2006). Measurements of historical total ozone from the Chalogne-Divan stellar spectrum programme: Paper 1. A reanalysis of the 1953-72 data and a comparison with the simultaneous Dobson Arosa measurements. *Journal of Geophysical Research*, 111, D12309. doi: 10.1029/2005JD006476
- Gröbner, J., & Blumthaler, M. (2007). Experimental determination of the reference plane of shaped diffusers by solar UV measurements. *Optics Letters*, 32(1), 80-82.
- Gu, L. H., Baldocchi, D., Verma, S. B., Black, T. A., Vesala, T., Falge, E. M., & Dowty, P. R. (2002). Advantages of diffuse radiation for terrestrial ecosystem productivity. *Journal of Geophysical Research*, 107(D6). doi: 10.1029/2001JD001242
- Hadjinicolaou, P., & Pyle, J. (2004). The impact of Arctic ozone depletion on northern middle latitudes:

- Interannual variability and dynamical control. *Journal of Atmospheric Chemistry*, 47, 25-43.
- Hadjinicolaou, P., Pyle, J. A., & Harris, N. R. P. (2005). The recent turnaround in stratospheric ozone over northern middle latitudes: A dynamical modeling perspective. *Geophysical Research Letters*, 32(L12821), DOI:10.1029/2005GL022476. doi: 10.1029/2005GL022476
- Hallock, P. (2005). Global change and modern coral reefs: New opportunities to understand shallow-water carbonate depositional processes. *Sedimentary Geology*, 175(1-4), 19-33.
- Hall-Spencer, J. M., Rodolfo-Metalpa, R., Martin, S., Ransome, E., Fine, M., Turner, S. M., . . . Buia, M. C. (2008). Volcanic carbon dioxide vents show ecosystem effects of ocean acidification. *Nature*, 454, 96-99.
- Hare, S. H. E., Gray, L. J., Lahoz, W. A., O'Neill, A., & Steenman-Clark, L. (2004). Can stratospheric temperature trends be attributed to ozone depletion? *Journal of Geophysical Research*, 109(D5111), DOI: 10.1029/2003JD003897.
- Harfoot, M. B. J., Beerling, D. J., Lomax, B. H., & Pyle, J. A. (2007). A two-dimensional atmospheric chemistry modeling investigation of Earth's Phanerozoic O₃ and near-surface ultraviolet radiation history. *Journal of Geophysical Research*, 112(D07308), doi:10.1029/2006JD007372.
- Harris, N. R. P., Kyrö, E., Staehelin, J., Brunner, D., Andersen, S.-B., Godin-Beekmann, S., . . . Zerefos, C. (2008). Ozone trends at northern mid- and high latitudes – a European perspective. *Annals of Geophysics*, 26, 1207-1220.
- Hegglin, M. I., & Shepherd, T. G. (2009). Large climate-induced changes in ultraviolet index and stratosphere-to-troposphere ozone flux. *Nature Geoscience*, DOI: 10.1038/NGEO1604. doi: 10.1038/NGEO604
- Helmig, D., Johnson, B., Oltmans, S. J., Neff, W., Eisele, F., & Davis, D. D. (2008). Elevated ozone in the boundary layer at South Pole. *Atmospheric Environment*, 42, 2788-2803.
- Helmig, D., Oltmans, S. J., Carlson, D., Lamarque, J. F., Jones, A., Labuschagne, C., . . . Hayden, K. (2007). A review of surface ozone in the polar regions. *Atmospheric Environment*, 41, 5138-5161. doi: 10.1016/j.atmosenv.2006.09.053
- Hendrick, F., Johnston, P. V., De Mazière, M., Fayt, C., Hermans, C., Kreher, K., . . . Van Roozendael, M. (2008). One-decade trend analysis of stratospheric BrO over Harestua (60°N) and Lauder (45°S) reveals a decline. *Geophysical Research Letters*, 35(L14801), doi:10.1029/2008GL034154.
- Herman, J. R. (2010). Global increase in UV irradiance during the past 30 years (1979 to 2008) estimated from satellite data. *Journal of Geophysical Research*, 115, D04203. doi: 10.1029/2009JD012219
- Herman, J. R. (2010). Use of an improved radiation amplification factor to estimate the effect of total ozone changes on action spectrum weighted irradiances and an instrument response function *Journal of Geophysical Research*, 115, D23119. doi: 10.1029/2010JD014317
- Heydenreich, J., & Wulf, H. C. (2005). Miniature personal electronic UVR dosimeter with erythema response and time-stamped readings in a wristwatch. *Photochemistry and Photobiology*, 81(5), 1138-1144 15850424. doi: **10.1562/2004-11-22-RA-376**
- Hicke, J. A., Slusser, J., Lantz, K., & Pascual, F. G. (2008). Trends and interannual variability in surface UVB radiation over 8 to 11 years observed across the United States. *Journal of Geophysical Research*, 113(D21302), doi:10.1029/2008JD009826.
- Hodgson, D. A., Verleyen, E., Sabbe, K., Squier, A. H., Keely, B. J., Leng, M. J., . . . Vyverman, W. (2005). Late Quaternary climate-driven environmental change in the Larsemann Hills, East Antarctica, multi-proxy evidence from a lake sediment core. *Quaternary Research*, 64(1), 83-99.
- Hodgson, D. A., Vyverman, W., Verleyen, E., Levitt, P. R., Sabbe, K., Squier, A. H., & Keely, B. J. (2005). Late Pleistocene record of elevated UV radiation in an Antarctic lake. *Earth and Planetary Science Letters*, 236, 565-572.
- Hofmann, D. J., & Montzka, S. A. (2009). Recovery of the ozone layer: the ozone depleting gas index. *Eos*,

90(1), 1-2.

- Hofmann, D. J., Oltmans, S. J., Harriss, J. M., Solomon, S., Deshler, T., & Johnson, B. J. (1992). Observation and possible causes of new ozone depletion in Antarctica in 1991. *Nature*, 359, 283-287. doi: 10.1038/359283a0
- Hofmann, D. J., & Solomon, S. (1989). Ozone destruction through heterogeneous chemistry following the eruption of El Chichon. *Journal of Geophysical Research*, 94(D), 5029-5041.
- Hoppel, K., Nedoluha, G., Fromm, M., Allen, D., Bevilacqua, R., Alfred, J., . . . König-Langlo, G. (2005). Reduced ozone loss at the upper edge of the Antarctic Ozone Hole during 2001–2004. *Geophysical Research Letters*, 32(L20816), DOI:10.1029/2005GL023968.
- Huck, P. E., McDonald, A. J., Bodeker, G. E., & Struthers, H. (2005). Inter-annual variability in Antarctic ozone depletion controlled by planetary waves and polar temperature. *Geophysical Research Letters*, 32(L13819), DOI:13810.11029/12005GL022943.
- Ialongo, I., Casale, G. R., & Siani, A. M. (2008). Comparison of total ozone and erythemal UV data from OMI with ground-based measurements at Rome station. *Atmospheric Chemistry and Physics*, 8, 3283-3289.
- Ilyas, M. (2007). Climate augmentation of erythemal UV-B radiation dose damage in the tropics and global change. *Current Science*, 93, 1604-1608.
- IPCC. (2001). *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press.
- IPCC. (2005). *IPCC/TEAP Special report: Safeguarding the ozone layer and the global climate system: Issues related to hydrofluorocarbons and perfluorocarbons. Summary for policymakers*. Geneva: IPCC.
- IPCC. (2007). IPCC Fourth Assessment Reports (AR4): Working Group I Report: The Physical Basis (Vol. All these AR4 reports, and synthesis summaries, are available on-line from <http://www.ipcc.ch/>): WMO/UNEP.
- Isaksen, I. S. A. (Ed.). (2003). (Editor) *EC Air Pollution Report No. 81: Ozone-Climate Interactions*.
- Isaksen, I. S. A., Dalsøren, S. B., Sundet, J. K., Grini, A., Zerefos, C., Kourtidis, K., . . . Zanis, P. (2005). Tropospheric ozone changes at unpolluted and semipolluted regions induced by stratospheric ozone changes. *Journal of Geophysical Research*, 110(2), 1-15.
- Iwao, K., & Hirooka, T. (2006). Dynamical quantifications of ozone mini-hole formation in both hemispheres. *Journal of Geophysical Research*, 111(D02104), DOI:10.1029/2005JD006333.
- Jäkel, E., Outer, P. d., Tax, R., Görts, P., & Reinen, H. (2007). Improving solar UV irradiance measurements by applying a temperature correction method for Teflon diffusers. *Applied Optics*, 46(20), 4222-4227.
- Jaroslawski, J., Krzyscin, J. W., Puchalski, S., & Sobolewski, P. (2003). On the optical thickness in the UV range: Analysis of the ground-based data taken at Belsk, Poland. *Journal of Geophysical Research*, 108(D23), art. no.-4722.
- Jenkin, M. E. (2008). Trends in ozone concentration distributions in the UK since 1990: Local, regional and global influences. *Atmospheric Environment*, 42, 5434-5445.
- Jones, A., Urban, J., Murtagh, D. P., Eriksson, P., Brohede, S., Haley, C., . . . Burrows, J. (2009). Evolution of stratospheric ozone and water vapour time series studied with satellite measurements. *Atmospheric Chemistry and Physics*, 9, 6055-6075.
- Josefsson, W. (2006). UV-radiation 1983–2003 measured at Norrköping, Sweden. *Theoretical and Applied Climatology*, 83(1), 59-76.
- Karoly, D. J. (2003). Ozone and climate change. *Science*, 302, 236-237.
- Kazadzis, S., Bais, A., Arola, A., Krotkov, N., Kouremeti, N., & Meleti, C. (2009). Ozone Monitoring Instrument spectral UV irradiance products: comparison with ground based measurements at an urban environment. *Atmospheric Chemistry and Physics*, 9(2), 585-594.

- Kazadzis, S., Bais, A., Balis, D., Kouremeti, N., Zempila, M., Arola, A., . . . Amiridis, V. (2009). Spatial and temporal UV irradiance and aerosol variability within the area of an OMI satellite pixel. *Atmospheric Chemistry and Physics*, 9(14), 4593-4601.
- Kazadzis, S., Bais, A., Kouremeti, N., Gerasopoulos, E., Garane, K., Blumthaler, M., . . . Cede, A. (2005). Direct spectral measurements with a Brewer spectroradiometer: absolute calibration and aerosol optical depth retrieval. *Applied Optics*, 44(9), 1681-1690.
- Kazadzis, S., Bais, A. F., Amiridis, V., Balis, D., Meleti, C., Kouremeti, N., . . . Kelektoglou, K. (2007). Nine years of UV aerosol optical depth measurements at Thessaloniki, Greece. *Atmospheric Chemistry and Physics*, 7, 2091-2101.
- Kazantzidis, A., Tourpali, K., & Bais, A. F. (2009). Variability of cloud-free ultraviolet dose rates on global scale due to modeled scenarios of future ozone recovery. *Photochemistry and Photobiology*, 86(1), 117-122.
- Keppler, F., Hamilton, J. T. G., Brass, M., & Rockmann, T. (2006). Methane emissions from terrestrial plants under aerobic conditions. *Nature*, 439, 187-191.
- Keppler, F., Hamilton, J. T. G., McRoberts, W. C., Vigano, I., Brass, M., & Rockmann, T. (2008). Methoxyl groups of plant pectin as a precursor of atmospheric methane: evidence from deuterium labelling studies. *New Phytologist*, 178, 808-814.
- Keppler, F., Kalin, R. M., Harper, D. B., McRoberts, W. C., & Hamilton, J. T. G. (2004). Carbon isotope anomaly in the major plant C1 pool and its global biogeochemical implications. *Biogeosciences*, 1, 123-131.
- Kimlin, M. G. (2004). The climatology of vitamin D producing ultraviolet radiation over the United States. *Journal of Steroid Biochemistry & Molecular Biology*, 89-90, 479-483.
- Knudsen, B. M., Harris, N. R. P., Andersen, S. B., Christiansen, B., Larsen, N., Rex, M., & Naujokat, B. (2004). Extrapolating future Arctic ozone losses. *Atmospheric Chemistry and Physics*, 4, 1849-1856. doi: 10.5194/acp-4-1849-2004
- Knuschke, P., Unverricht, I., Ott, G., & Jansen, M. (2007). Personenbezogene messung der UV-Exposition von Arbeitnehmern im freien (pp. 195). Dortmund/Berlin/Dresden: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAUA).
- Ko, M. K. W., Sze, N. D., Molnar, G., & Prather, M. J. (1993). Global warming from chlorofluorocarbons and their alternatives: Time scales of chemistry and climate. *Atmospheric Environment. Part A. General Topics*, 27(4), 581-587. doi: 10.1016/0960-1686(93)90215-K
- Ko, M. K. W., Sze, N.-D., & Prather, M. J. (1994). Better protection of the ozone layer. *Nature*, 367, 505-508. doi: 10.1038/367505a0
- Kobylnski, V. S., Hafer, B., & Kohde, G. (1984). Correlative pathologic studies on the role of vitamin D in vascular calcinosis in childhood (Trans from: Korrelationspathologische untersuchungen zur rolle de vitamins D bei den gefasskalzinosen im kindesalter). *Zentralblatt für Allgemeine Pathologie und Pathologische Anatomie*, 129, 137-147.
- Koepke, P., & Mech., M. (2005). UV radiation on arbitrarily oriented surfaces: Variation with atmospheric and ground properties. *Theoretical and Applied Climatology*, 81, 25-32.
- Konopka, P., Engel, A., Funke, B., Müller, R., Groß, J.-U., Günther, G., . . . Riese, M. (2007). Ozone loss driven by nitrogen oxides and triggered by stratospheric warmings can outweigh the effect of halogens. *Journal of Geophysical Research*, 112(D05105), doi:10.1029/2006JD007064.
- Kopcke, W., & Krutmann, J. (2008). Protection from sunburn with beta-Carotene - a meta-analysis. *Photochemistry and Photobiology*, 84, 284-288.
- Koronakis, P. S., Sfantos, G. K., Paliatsos, A. G., Kaldellis, J. K., Garofalakis, J. E., & Koronaki, I. P. (2002). Interrelations of UV-global/global/diffuse solar irradiance components and UV-global attenuation on air pollution episode days in Athens, Greece. *Atmospheric Environment*, 36(19), 3173-3181.
- Kourtidis, K. (2004). Transfer of organic Br and Cl from the biosphere to the atmosphere during the

- Cretaceous/Tertiary Impact: Implications for the stratospheric ozone layer. *Atmospheric Chemistry and Physics Discussions*, 4, 6769-6787.
- Kowalok, M. E. (1993). Common threads: Research lessons from acid rain, ozone depletion, and global warming. *Environment* 35(6), 12-20.
- Krotkov, N. A., Bhartia, P. K., Herman, J. R., Slusser, J. R., Labow, G. J., Scott, G. R., . . . Holben, B. N. (2005). Aerosol ultraviolet absorption experiment (2002 to 2004), part 1: ultraviolet multifilter rotating shadowband radiometer calibration and intercomparison with CIMEL sunphotometers. *Optical Engineering*, 44, 0410051-0410051, 0041005-0410017.
- Krotkov, N. A., Bhartia, P. K., Herman, J. R., Slusser, J. R., Scott, G. R., Labow, G. J., . . . Holben, B. N. (2005). Aerosol ultraviolet absorption experiment (2002 to 2004), part 2: absorption optical thickness, refractive index, and single scattering albedo. *Optical Engineering*, 44, 041006-041001, 041006-041017.
- Krotkov, N. A., Herman, J. R., Cede, A., & Labow, G. (2005, 31 July-4 August 2005). *Partitioning between aerosol and NO₂ absorption in the UV spectral region*. Paper presented at the Ultraviolet Ground- and Space-based Measurements, Models, and Effects V.
- Krzyscin, J. W., Eerme, K., & Janouch, M. (2004). Long-term variations of the UV-B radiation over Central Europe as derived from the reconstructed UV time series. *Annales Geophysicae*, 22(5), 1473-1485.
- Kumari, B. P., Londhe, A. L., Daniel, S., & Jadhav, D. B. (2007). Observational evidence of solar dimming: Offsetting surface warming over India. *Geophysical Research Letters*, 34, L21810. doi: 10.1029/2007GL031133
- Kuroda, Y., & Kodera, K. (2005). Solar cycle modulation of the Southern Annular Mode. *Geophysical Research Letters*, 32(L13802), DOI:10.1029/2005GL022516.
- Kvalevag, M. M., Myhre, G., & Lund Myhre, C. E. (2009). Extensive reduction of surface UV radiation since 1750 in world's populated regions. *Atmospheric Chemistry and Physics Discussions*, 9, 10457-10486.
- Kylling, A., Webb, A. R., Kift, R., Gobbi, G. P., Ammannato, L., Barnaba, F., . . . Mayer, B. (2005). Spectral actinic flux in the lower troposphere: measurement and 1-D simulations for cloudless, broken cloud and overcast situations. *Atmospheric Chemistry and Physics*, 5, 1975-1997.
- Langematz, U., Grenfell, J. L., Matthes, K., Mieth, P., Kunze, M., Steil, B., & Brühl, C. (2005). Chemical effects in 11-year solar cycle simulations with the Freie Universität Berlin Climate Middle Atmosphere Model with online chemistry (FUB-CMAM-CHEM). *Geophysical Research Letters*, 32(L13803), DOI:10.1029/2005GL022686.
- Lee, A. M., Jones, R. L., Kilbane-Dawe, I., & Pyle, J. A. (2002). Diagnosing ozone loss in the extratropical lower stratosphere. *Journal of Geophysical Research*, 107(D11), 10.1029/2001JD000538.
- Lee-Taylor, J., & Madronich, S. (2007). Climatology of UV-A, UV-B, and erythemal radiation at the Earth's surface, 1979-2000 *NCAR Technical Note NCAR/TN-474+STR* (<http://cprm.acd.ucar.edu/Models/TUV/>) (pp. 52). Boulder: NCAR.
- Lemmen, C., Guenther, G., Mager, F., Konopka, P., Dameris, M., & Mueller, R. (2004). Recalculation of Arctic ozone hole recovery predictions with a detailed chemistry Lagrangian transport model [poster]. Victoria, Canada.
- Lenton, A., Codron, F., Bopp, L., Metzl, N., Cadule, P., Tagliabue, A., & Le Sommer, J. (2009). Stratospheric ozone depletion reduces ocean carbon uptake and enhances ocean acidification. *Geophysical Research Letters*, 36(L12606), doi:10.1029/2009GL038227.
- Lesser, M. P., Barry, T. M., Lamare, M. D., & Barker, M. F. (2006). Biological weighting functions for DNA damage in sea urchin embryos exposed to ultraviolet radiation. *Journal of Experimental Marine Biology and Ecology*, 328, 10-21.
- Levi, B. G. (1992). Arctic measurements indicate the chilly prospect of ozone depletion. *Physics Today*, 45(7), 17-19.

- Li, F., Stolarski, R. S., & Newman, P. A. (2009). Stratospheric ozone in the post-CFC era. *Atmospheric Chemistry and Physics*, 9, 2207–2213.
- Li, S., Matthews, J., & Sinha, A. (2008). Atmospheric hydroxyl radical production from electronically excited NO₂ and H₂O. *Science*, 319, 1657–1660.
- Liley, J. B. (2009). New Zealand dimming and brightening. *Journal of Geophysical Research*, 114, D00D10. doi: 10.1029/2008JD011401
- Liley, J. B., & Forgan, B. W. (2009). Aerosol optical depth over Lauder, New Zealand. *Geophysical Research Letters*, 36, L07811. doi: 10.1029/2008GL037141
- Lindfors, A., Heikkilä, A., Kaurola, J., Koskela, T., & Lakkala, K. (2009). Reconstruction of solar spectral surface UV irradiances using radiative transfer simulations. *Photochemistry and Photobiology*. doi: DOI: 10.1111/j.1751-1097.2009.00578.x
- Lindfors, A., & Vuilleumier, L. (2005). Erythemal UV at Davos (Switzerland), 1926–2003, estimated using total ozone, sunshine duration, and snow depth. *Journal of Geophysical Research*, 110(D02104), DOI:10.1029/2004JD005231.
- Lindfors, A. V., Arola, A., Kaurola, J., Taalas, P., & Svenoe, T. (2003). Long-term erythemal UV doses at Sodankylä estimated using total ozone, sunshine duration, and snow depth. *Journal of Geophysical Research*, 108(D16), DOI:10.1029/2002JD003325.
- Lomax, B., Beerling, D., Callaghan, T., Fraser, W., Harfoot, M., Pyle, J., . . . Wellman, C. (2005). The siberian traps, stratospheric ozone, UV-B flux and mutagenesis.
- Lovengreen, C., Fuenzalida, A., H., & Videla, L. (2005). On the spectral dependency of UV radiation enhancements due to clouds in Valdivia, Chile (39.8°S). *Journal of Geophysical Research*, 110(D14, D14207), DOI:10.1029/2004JD005372.
- Madronich, S. (2007). Analytic Formula for the Clear-sky UV Index. *Photochemistry and Photobiology*, 83(6), 1537–1538. doi: doi:10.1111/j.1751-1097.2007.00200.x
- Madronich, S., McKenzie, R. L., Björn, L. O., & Caldwell, M. M. (1998). Changes in biologically active ultraviolet radiation reaching the Earth's surface. *Journal of Photochemistry and Photobiology B*, 46, 5–19.
- Makhotkina, E. L., Plakhina, I. N., & Lukin, A. B. (2005). Some features of atmospheric turbidity change over the Russian territory in the last quarter of the 20th century. *Russian Meteorology and Hydrology (Meteorologiya i Gidrologiya)*, 1, 20–27.
- Mang, S. A., Henricksen, D. K., Adam P. Bateman, Andersen, M. P. S., Blake, D. R., & Nizkorodov, S. A. (2008). Contribution of carbonyl photochemistry to aging of atmospheric secondary organic aerosol. *Journal of Physical Chemistry A*, 112, 8337–8344.
- Manninen, P., Hovila, J., Seppala, L., Karha, P., Ylianttila, L., & Ikonen, E. (2006). Determination of distance offsets of diffusers for accurate radiometric measurements. *Metrologia*, 43, S120–S140 doi: 110.1088/0026-1394/1043/1082/S1024.
- Marchand, M., Bekki, S., Lefevre, F., Hauchecorne, A., Godin-Beekmann, S., & Chipperfield, M. P. (2004). Model simulations of the northern extratropical ozone column: Influence of past changes in chemical composition. *Journal of Geophysical Research*, 109(D02310), DOI:10.1029/2003JD003634.
- Mayer, B., Fischer, C. A., & Madronich, S. (1998). Estimation of surface actinic flux from satellite (TOMS) ozone and reflectivity measurements. *Geophysical Research Letters*, 25(23), 4321–4324.
- Mayer, B., & Madronich, S. (2004). Actinic flux and photolysis in water droplets: Mie calculations and geometrical optics limit. *Atmospheric Chemistry and Physics*, 4(2241–2250).
- Mazza, C. A., Izaguirre, M. M., Curiale, J., & Ballare, C. L. (2009). A look into the invisible: ultraviolet-B sensitivity in an insect (*Caliothrips phaseoli*) revealed through a behavioural action spectrum. *Proceedings of the Royal Society B*, 10.1098/rspb.2009.1565. doi: 10.1098/rspb.2009.1565
- McFarland, M., & Kaye, J. (1992). Chlorofluorocarbons and ozone. *Photochemistry and Photobiology*, 55(6), 911–929. doi: 10.1111/j.1751-1097.1992.tb08540.x

- McKenzie, R., Smale, D., Bodeker, G., & Claude, H. (2003). Ozone profile differences between Europe and New Zealand: Effects on surface UV irradiance and its estimation from satellite sensors. *Journal of Geophysical Research*, *108*, 4179-4110.1029/2002JD002770.
- McKenzie, R., Smale, D., & Kotkamp, M. (2004). Relationship between UVB and erythemally weighted radiation. *Photochemical & Photobiological Sciences*, *3*(3), 252 - 256.
- McKenzie, R. L., Aucamp, P. J., Bais, A. F., Björn, L. O., & Ilyas, M. (2007). Changes in biologically active ultraviolet radiation reaching the Earth's surface. *Photochemical & Photobiological Sciences*, *7*(6), 218-231. doi: 10.1039/B700017K
- McKenzie, R. L., Aucamp, P. J., Bais, A. F., Björn, L. O., Ilyas, M., & Madronich, S. (2011). Ozone depletion and climate change: impacts on UV radiation. *Photochemical & Photobiological Sciences*, *10*, 182-198. doi: 10.1039/C0PP90034F
- McKenzie, R. L., Björn, L. O., Bais, A., & Ilyas, M. (2003). Changes in biologically active ultraviolet radiation reaching the Earth's surface. *Photochemical & Photobiological Sciences*, *2*(1), 5-15.
- McKenzie, R. L., Bodeker, G. E., Johnston, P. V., & Kotkamp, M. (2004, 2-8 June 2004). *Long term changes in summertime UV radiation in New Zealand in response to ozone change*. Paper presented at the Proceedings of the XX Quadrennial Ozone Symposium, Kos, Greece.
- McKenzie, R. L., Bodeker, G. E., Scott, G., & Slusser, J. (2006). Geographical differences in erythemally-weighted UV measured at mid-latitude USDA sites. *Photochemical & Photobiological Sciences*, *5*(3), 343 - 352.
- McKenzie, R. L., Connor, B. J., & Bodeker, G. E. (1999). Increased summertime UV observed in New Zealand in response to ozone loss. *Science*, *285*(10 September), 1709-1711.
- McKenzie, R. L., Liley, J. B., & Björn, L. O. (2009). UV Radiation: Balancing Risks and Benefits. *Photochemistry and Photobiology*, *85*, 88-98. doi: DOI: 10.1111/j.1751-1097.2008.00400.x
- McKenzie, R. L., Weinreis, C., Johnston, P. V., Liley, B., Shiona, H., Kotkamp, M., . . . Kondo, Y. (2008). Effects of urban pollution on UV spectral irradiances. *Atmospheric Chemistry and Physics*, *8*, 5683-5697.
- McKinlay, A. F., & Diffey, B. L. (1987). A reference action spectrum for ultra-violet induced erythema in human skin. In W. F. Passchier & B. F. M. Bosnjakovic (Eds.), *Human Exposure to Ultraviolet Radiation: Risks and Regulations* (pp. 83-87). Amsterdam: Elsevier.
- McLeod, A. R., Fry, S. C., Loake, G. J., Messenger, D. J., Reay, D. S., Smith, K. A., & Yun, B.-W. (2008). Ultraviolet radiation drives methane emissions from terrestrial plant pectins. *New Phytologist*, doi: 10.1111/j.1469-8137.2008.02571.x.
- Medhaug, I., Olseth, J. A., & Reuder, J. (2009). UV Radiation and Skin Cancer in Norway. *Journal of Photochemistry and Photobiology B: Biology*, *96*, 232-241. doi: 10.1016/j.jphotobiol.2009.06.011
- Meleti, C., A. Bais, C. Zerefos, K. Garane, S. Kazadzis. (2004, 1-8 June 2004). *Temporal and spatial variability of solar ultraviolet measurements in Greece*. Paper presented at the XX Quadrennial Ozone Symposium, Kos.
- Meleti, C., Bais, A., Kazadzis, S., Kouremeti, N., Garane, K., & Zerefos, C. (2009). Factors affecting solar ultraviolet irradiance measured since 1990 at Thessaloniki, Greece. *International Journal of Remote Sensing*, *30*(15-16), 4167-4179.
- Meloni, D., di Sarra, A., Herman, J. R., Monteleone, F., & Piacentini, S. (2005). Comparison of ground-based and Total Ozone Mapping Spectrometer erythemal UV doses at the island of Lampedusa in the period 1998-2003: Role of tropospheric aerosols. *Journal of Geophysical Research*, *110*(D01202), DOI:10.1029/2004JD005283.
- Meneghini, B., Simmonds, I., & Smith, I. N. (2007). Association between Australian rainfall and the Southern Annular Mode. *International Journal of Climatology*, *27*, 109-121. doi: 10.1002/joc.1370
- Micheletti, M. I., Piacentini, R. D., & Madronich, S. (2003). Sensitivity of biologically active UV radiation to stratospheric ozone changes: effect of action spectrum shape and wavelength range. *Photochemistry and Photobiology*, *78*(5), 456-461.

- Miller, H., L. III, Neale, P. J., & Dunton, K. H. (2009). Biological weighting functions for UV inhibition of photosynthesis in the kelp *Laminaria hyperborea* (phaeophyceae). *Journal of Phycology*, *45*, 571-584.
- Miller, W. L., Moran, M. A., Sheldon, W. M., Zepp, R. G., & Opsahl, S. P. (2002). Determination of apparent quantum yield spectra for the formation of biologically labile photoproducts. *Limnology and Oceanography*, *47*(2), 343-352.
- Molina, M., Zaelke, D., Sarma, K. M., Andersen, S. O., Ramanathan, V., & Kaniaru, D. (2009). Reducing abrupt climate change risk using the Montreal Protocol and other regulatory actions to complement cuts in CO₂ emissions. *Proceedings of the National Academy of Sciences of the United States of America*, *106*(49), 20616-20621.
- Montzka, S. A., Butler, J. H., Hall, B. D., Mondeel, D. J., & Elkins, J. W. (2003). A decline in tropospheric organic bromine. *Geophysical Research Letters*, *30*(15), 1826, DOI 10.1029/2003GL017745.
- Moore, R. M. (2008). A photochemical source of methyl chloride in saline waters. *Environmental Science and Technology*, *42*, 1933-1937.
- Morgenstern, O., Braesicke, P., Hurwitz, M. M., O'Connor, F. M., Bushell, A. C., Johnson, C. E., & Pyle, J. A. (2008). The world avoided by the Montreal Protocol. *Geophysical Research Letters*, *35*(L16811), doi: 10.1029/2008GL034590.
- Morrisette, P. M. (1989). The evolution of policy responses to stratospheric ozone depletion. *Natural Resources Journal*, *29*, 793-820.
- Munakata, N., Kazadzis, S., Bolseé, D., Schuch, N., Koskela, T., Karpetchko, A., . . . Hieda, K. (2009). Variations and trends of biologically effective doses of solar ultraviolet radiation in Asia, Europe and South America from 1999 to 2007. *Photochemical & Photobiological Sciences*, *8*, 1117-1124. doi: 10.1039/b906975e
- Muscheler, R., Joos, F., Müller, S. A., & Snowball, I. (2005). How unusual is today's solar activity? *Nature*, *436*, E3-E4.
- NASA Jet Propulsion Laboratory Panel for Data Evaluation. (2006). *Chemical Kinetics and Photochemical Data for Atmospheric Studies* (Vol. 06-2). Los Angeles: NASA Jet Propulsion Laboratory Panel for Data Evaluation,.
- NASA Jet Propulsion Laboratory Panel for Data Evaluation. (2009). *Chemical Kinetics and Photochemical Data for Atmospheric Studies Evaluation Number 16* (Vol. 09-31). Los Angeles: NASA Jet Propulsion Laboratory Panel for Data Evaluation,.
- Newchurch, M. J., Yang, E.-S., Cunnold, D. M., Reinsel, G. C., Salawitch, R. J., Zawodny, J. M., . . . McCormick, M. P. (2004, 2004). *First stage of stratospheric ozone recovery*. Paper presented at the XX Quadrennial Ozone Symposium, Kos.
- Newchurch, M. J., Yang, E.-S., Cunnold, D. M., Reinsel, G. C., Zawodny, J. M., & Russell, J. M., III. (2003). Evidence for slowdown in stratospheric ozone loss: First stage of ozone recovery. *Journal of Geophysical Research*, *108*, 4507 4510.1029/2003JD003471.
- Newman, P. A., Daniel, J. S., Waugh, D. W., & Nash, E. R. (2007). A new formulation of equivalent effective stratospheric chlorine (EESC). *Atmospheric Chemistry and Physics*, *7*, 4537-4552.
- Newman, P. A., Oman, L. D., Douglass, A. R., Fleming, E. L., Frith, S. M., Hurwitz, M. M., . . . Velders, G. J. M. (2009). What would have happened to the ozone layer if chlorofluorocarbons (CFCs) had not been regulated? *Atmospheric Chemistry and Physics*, *9*, 2113-2128.
- Nolte, C. G., Gilliland, A. B., Hogrefe, C., & Mickley, L. J. (2008). Linking global to regional models to assess future climate impacts on surface ozone levels in the United States. *Journal of Geophysical Research-Atmospheres*, *113*, D14307. doi: 10.1029/2007JD008497
- Norris, J. R., & Wild, M. (2007). Trends in aerosol radiative effects over Europe inferred from observed cloud cover, solar "dimming," and solar "brightening". *Journal of Geophysical Research - Atmospheres*, *112*(D08214), doi:10.1029/2006JD007794.

- O'Gorman, P. A., & Schneider, T. (2009). The physical basis for increases in precipitation extremes in simulations of 21st-century climate change. *Proceedings of the National Academy of Sciences of the United States of America*, *106*(35), 14773-14777.
- Ohvriil, H., Teral, H., Neiman, L., Kannel, M., Uustare, M., Tee, M., . . . Laulainen, N. (2009). Global dimming and brightening versus atmospheric column transparency, Europe, 1906-2007. *Journal of Geophysical Research*, *114*(D00D12), doi:10.1029/2008JD010644.
- Oriowo, O. M., Cullen, A. P., Chou, B. R., & Sivak, J. G. (2001). Action spectrum and recovery for in vitro UV-induced cataract using whole lenses. *Investigative Ophthalmology & Visual Science*, *42*(11), 2596-2602.
- Orlova, T. N., & Terenetskaya, I. P. (2009). Possible use of provitamin D3 photoisomerization for spectral dosimetry of bioactive antirachitic UV radiation. *Journal of Applied Spectroscopy*, *76*, 240-244.
- Osburn, C. L., Zagarese, H. E., Morris, D. P., Hargreaves, B. R., & Cravero, W. E. (2001). Calculation of spectral weighting functions for the solar photobleaching of chromophoric dissolved organic matter in temperate lakes. *Limnology and Oceanography*, *46*(6), 1455-1467.
- Otero, S., Núñez-Olivera, E., Martínez-Abaiagar, J., Tomás, R., & Huttunen, S. (2009). Retrospective bioindication of stratospheric ozone and ultraviolet radiation using hydroxycinnamic acid derivatives of herbarium samples of an aquatic liverwort. *Environmental Pollution*, *157*(8-9), 2335-2344. doi: 10.1016/j.envpol.2009.03.025
- Overland, J., Turner, J., Jennifer Francis, Gillett, N., Marshall, G., & Tjernström, M. (2008). The Arctic and Antarctic: Two faces of climate change. *Eos (Transactions of the American Geophysical Union)*, *89*(11), 177-178.
- Pandey, S. P., & Baldwin, I. T. (2008). Silencing RNA-directed RNA polymerase 2 increases the susceptibility of *Nicotiana attenuata* to UV in the field and in the glasshouse. *Plant Journal*, *54*, 845-862.
- Panicker, A. S., Pandithurai, G., Takamura, T., & Pinker, R. T. (2009). Aerosol effects in the UV-B spectral region over Pune, an urban site in India. *Geophysical Research Letters*, *36*, L10802. doi: 10.1029/2009GL037632
- Pazmiño, A. F., Godin-Beekmann, S., Luccini, E. A., Piacentini, R. D., Quel, E. J., & Hauchecorne, A. (2008). Increased UV radiation due to polar ozone chemical depletion and vortex occurrences at Southern Sub-polar Latitudes in the period [1997-2005]. *Atmospheric Chemistry and Physics*, *8*, 5339-5352.
- Peguet-Navarro, J., Dezutter-Dambuyant, C., Buetler, T., Leclaire, J., Smola, H., Blum, S., . . . Gueniche, A. (2008). Supplementation with oral probiotic bacteria protects human cutaneous immune homeostasis after UV exposure-double blind, randomized, placebo controlled clinical trial. *European Journal of Dermatology*, *18*, 504-511. doi: ejd.2008.0496 [pii] 10.1684/ejd.2008.0496 [doi]
- Peng, X., Tan, J., Tang, C., Yu, Y., & Wangt, Z. (2008). Multiresidue determination of fluoroquinolone, sulfonamide, trimethoprim, and chloramphenicol antibiotics in urban waters in China. *Environmental Toxicology and Chemistry*, *27*, 73-79.
- Peters, D. H. W., Gabriel, A., & Entzian, G. (2008). Longitude-dependent decadal ozone changes and ozone trends in boreal winter months during 1960-2000. *Annals of Geophysics*, *26*(5), 1275-1286.
- Petters, J. L., Saxena, V. K., Slusser, J. R., Wenny, B. N., & Madronich, S. (2003). Aerosol single scattering albedo retrieved from measurements of surface UV irradiance and a radiative transfer model. *Journal of Geophysical Research*, *108*(D9), DOI:10.1029/2002JD002360.
- Pfeifer, M. T., Koepke, P., & Reuder, J. (2006). Effects of altitude and aerosol on UV radiation. *Journal of Geophysical Research*, *111*(D01203), DOI:10.1029/2005JD006444.
- Pfister, G., McKenzie, R. L., Liley, J. B., Thomas, A., Forgan, B. W., & Long, C. N. (2003). Cloud coverage based on all-sky imaging and its impact on surface solar irradiance. *Journal of Applied Meteorology*, *42*(10), 1421-1434.
- Piacentini, R. D., Cede, A., & Barcena, H. (2003). Extreme solar total and UV irradiances due to cloud effect

- measured near the summer solstice at the high-altitude desertic plateau Puna of Atacama (Argentina). *Journal of Atmospheric and Solar-Terrestrial Physics*, 65(6), 727-731.
- Pinker, R. T., Zhang, B., & Dutton, E. G. (2005). Do satellites detect trends in surface solar radiation? *Science*, 308, 850-854.
- Pool, R. (1989). The elusive replacements for CFCs. *Science*, 242(4879), 666-668. doi: 10.1126/science.242.4879.666
- Pope, S. J., Holick, M. F., Mackin, S., & Godar, D. E. (2008). Action spectrum conversion factors to change erythemally weighted to previtamin D3-weighted UV doses. *Photochemistry and Photobiology*, 84, 1277-1283. doi: 10.1111 .j.1751-1097.2008.00373.x
- Prather, M. J., & Hsu, J. (2008). NF3, the greenhouse gas missing from Kyoto. *Geophysical Research Letters*, 35(L12810), doi:10.1029/2008GL034542.
- Prather, M. J., & Watson, R. T. (1990). Stratospheric ozone depletion and future levels of atmospheric chlorine and bromine. *Nature*, 344, 729-734. doi: 10.1038/344729a0
- Pyle, J., Shepherd, T. G., Bodeker, G., Canziani, P., Dameris, M., Forster, P., . . . Randel, W. (2005). *Ozone and Climate* (Vol. in press). Geneva.
- Qaderi, M. M., Reid, D. M., & Yeung, E. C. (2007). Morphological and physiological responses of canola (*Brassica napus*) siliques and seeds to UVB and CO₂ under controlled environment conditions. *Environmental and Experimental Botany*, 60, 428-437.
- Quaite, F. E., Sutherland, B. M., & Sutherland, J. C. (1992). Action Spectrum for DNA damage in alfalfa lowers predicted impact of ozone depletion. *Nature*, 358, 576-578.
- Ramaswamy, V., Schwarzkopf, M. D., Randel, W. J., Santer, B. D., Soden, B. J., & Stenchikov, G. L. (2006). Anthropogenic and natural influences in the evolution of lower stratospheric cooling. *Science*, 311(1138-1141).
- Randall, C. E., Harvey, V. L., Manney, G. L., Orsolini, Y., Codrescu, M., Sioris, C., . . . Russell, J. M., III. (2005). Stratospheric effects of energetic particle precipitation in 2003–2004. *Geophysical Research Letters*, 32(L05802), DOI:10.1029/2004GL022003.
- Ravishankara, A. R., Daniel, J. S., & Portmann, R. W. (2009). Nitrous Oxide (N₂O): The Dominant Ozone-Depleting Substance Emitted in the 21st Century. *Science*, 326(5949), 123-125. doi: 10.1126/science.1176985
- Ravishankara, A. R., Turnipseed, A. A., Jensen, N. R., Barone, S., Mills, M., Howard, C. J., & Solomon, S. (1994). Do hydrofluorocarbons destroy stratospheric ozone? *Science*, 263(5143), 71-75. doi: 10.1126/science.263.5143.71
- Read, K. A., Mahajan, A. S., Carpenter, L. J., Evans, M. J., Faria, B. V. E., Heard, D. E., . . . Plane, J. M. C. (2008). Extensive halogen-mediated ozone destruction over the tropical Atlantic Ocean. *Nature*, 453, 1232-1235. doi: 10.1038/nature07035
- Redeker, K. R., & Cicerone, R. J. (2004). Environmental controls over methyl halide emissions from rice paddies. *Global Biogeochemical Cycles*, 18(1), DOI: GB1027.
- Redeker, K. R., Manley, S. L., Brothers, L., McDuffee, K., Walser, M., & Cicerone, R. J. (2004). Seasonal mass balance of halogens in simulated rice paddies. *Geophysical Research Letters*, 31(L11504), DOI:10.1029/2004GL019579.
- Redeker, K. R., Treseder, K. K., & Allen, M. F. (2004). Ectomycorrhizal fungi: A new source of atmospheric methyl halides? *Global Change Biology*, 10, 1009-1016.
- Reeves, C. E., Sturges, W. T., Sturrock, G. A., Preston, K., Oram, D. E., Schwander, J., . . . Chappellaz, J. (2005). Trends of halon gases in polar firn air: implications for their emission distributions. *Atmospheric Chemistry and Physics*, 5, 2055-2064.
- Reimann, S., Vollmer, M. K., Folini, D., Steinbacher, M., Hill, M., Buchmann, B., . . . Mahieu, E. (2008). Observations of long-lived anthropogenic halocarbons at the high-Alpine site of Jungfraujoch (Switzerland) for assessment of trends and European sources. *Science of the Total Environment*,

391, 224 – 231.

- Reinsel, G. C., Miller, A. J., Weatherhead, E. C., Flynn, L. E., Nagatani, R. M., Tiao, G. C., & Wuebbles, D. J. (2005). Trend analysis of total ozone data for turnaround and dynamical contributions. *Journal of Geophysical Research*, *110*(D16306), DOI:10.1029/2004JD004662.
- Reinsel, G. C., Weatherhead, E., Tiao, G. C., Miller, A. J., Nagatani, R. M., Wuebbles, D. J., & Flynn, L. E. (2002). On detection of turnaround and recovery in trend for ozone. *Journal of Geophysical Research*, *107*, 10.1029/2001JD000500.
- Reuder, J., & Koepke, P. (2005). Reconstruction of UV radiation over Southern Germany for the past decades. *Meteorologische Zeitschrift*, *14*(2), 237-246.
- Rex, M., Salawitch, R. J., Deckelmann, H., Gathen, P. v. d., Harris, N. R. P., Chipperfield, M. P., . . . Zerefos, C. (2006). Arctic winter 2005: Implications for stratospheric ozone loss and climate change. *Geophysical Research Letters*, *33*, L23808. doi: 10.1029/2006GL026731
- Rex, M., Salawitch, R. J., von der Gathen, P., Harris, N. R. P., Chipperfield, M. P., & Naujokat, B. (2004). Arctic ozone loss and climate change. *Geophysical Research Letters*, *31*(L04116), DOI:10.1029/2003GL018844.
- Rind, D., Jonas, J., Stammerjohn, S., & Lonergan, P. (2009). The Antarctic ozone hole and the Northern Annular Mode: A stratospheric interhemispheric connection. *Geophysical Research Letters*, *36*, L09818. doi: 10.1029/2009GL037866
- Rind, D., Perlwitz, J., & Lonergan, P. (2005). AO/NAO response to climate change: 1. Respective influences of stratospheric and tropospheric climate changes. *Journal of Geophysical Research*, *110*(D12107), DOI:10.1029/2004JD005103.
- Rind, D., Perlwitz, J., Lonergan, P., & Lerner, J. (2005). AO/NAO response to climate change: 2. Relative importance of low- and high-latitude temperature changes. *Journal of Geophysical Research*, *110*(D12108), DOI:10.1029/2004JD005686.
- Rinsland, C. P., Goldman, A., Elkins, J. W., Chiou, L. S., Hannigan, J. W., Wood, S. W., . . . Zander, R. (2006). Long-term trend of CH₄ at northern mid-latitudes: Comparison between ground-based infrared solar and surface sampling measurements. *Journal of Quantitative Spectroscopy and Radiative Transfer*, *97*(3), 457-466.
- Rohen, G., von Savigny, C., Sinnhuber, M., Llewellyn, E. J., Kaiser, J. W., Jackman, C. H., . . . Burrows, J. P. (2005). Ozone depletion during the solar proton events of October/November 2003 as seen by SCIAMACHY. *Journal of Geophysical Research*, *110*(A09S39), DOI: 10.1029/2004JA010984.
- Rosenfield, J. E., & Schoeberl, M. R. (2005). Recovery of the tropical lower stratospheric ozone layer. *Geophysical Research Letters*, *32*(L21806), DOI:10.1029/2005GL023626.
- Rowland, F. S. (2006). Stratospheric ozone depletion. *Philosophical Transactions of the Royal Society B*, *361*(1469), 769-790. doi: 10.1098/rstb.2005.1783
- Rozema, J., Blokker, P., Mayoral Fuertes, M. A., & Broekman, R. (2009). UV-B absorbing compounds in present-day and fossil pollen, spores, cuticles, seed coats and wood: evaluation of a proxy for solar UV radiation. *Photochemical & Photobiological Sciences*, *8*, 1233-1243. doi: 10.1039/B904515E, Perspective
- Rozema, J., van Geel, B., Björn, L. O., Lean, J., & Madronich, S. (2002). Toward Solving the UV Puzzle. *Science*, *296*(31 May), 1621-1622.
- Ruckstuhl, C., Philipona, R., Behrens, K., Coen, M., Durr, B., Heimo, A., . . . Zelenka, A. (2008). Aerosol and cloud effects on solar brightening and the recent rapid warming. *Geophysical Research Letters*, *35*(L12708), 10.1029/2008GL034228.
- Rumble, D. (2005). A mineralogical and geochemical record of atmospheric photochemistry (Presidential address to the Mineralogical Society of America, Seattle, November 4, 2003). *American Mineralogist*, *90*, 918-930.
- Ryan, K. G., Burne, A., & Seppelt, R. D. (2009). Historical ozone concentrations and flavonoid levels in

- herbarium specimens of the Antarctic moss *Bryum argenteum*. *Global Change Biology*, 15(7), 1694-1702. doi: 10.1111/j.1365-2486.2009.01885.x
- Sabburg, J., & Wong, J. (2000). The effect of clouds on enhancing UVB irradiance at the earth's surface: a one year study. *Geophysical Research Letters*, 27(20), 3337-3340. doi: 10.1029/2000GL011683
- Sabburg, J., & Wong, J. (2000). Evaluation of a sky/cloud formula for estimating UV-B irradiance under cloudy skies. *Journal of Geophysical Research*, 105(D24), 29,685-629,692. doi: 10.1029/2000JD900530
- Sabburg, J. M., & Parisi, A. V. (2006). Spectral dependency of cloud enhanced UV irradiance. *Atmospheric Research*, 81(3), 206-214. doi: 10.1016/j.atmosres.2005.11.011
- Salawitch, R. J., Weisenstein, D. K., Kovalenko, L. J., Sioris, C. E., Wennberg, P. O., Chance, K., . . . McLinden, C. A. (2005). Sensitivity of ozone to bromine in the lower stratosphere. *Geophysical Research Letters*, 32(L05811), doi:10.1029/2004GL021504.
- Scaife, A. A., Knight, J. R., Vallis, G. K., & Folland, C. K. (2005). A stratospheric influence on the winter NAO and North Atlantic surface climate. *Geophysical Research Letters*, 32(L18715), DOI:10.1029/2005GL023226.
- Schade, G. W., Hofmann, R. M., & Crutzen, P. J. (1999). CO emissions from degrading plant matter (I). Measurements. *Tellus, Series B: Chemical and Physical Meteorology*, 51(5), 889-908.
- Scheirer, R., & Schmidt, S. (2005). CLABAUTAIR: a new algorithm for retrieving three-dimensional cloud structure from airborne microphysical measurements. *Atmospheric Chemistry and Physics*, 5, 2333-2340.
- Schmucki, D. A., & Philipona, R. (2002). Ultraviolet radiation in the Alps: the altitude effect. *Optical Engineering*, 41(12), 3090-3095.
- Schneider, B., Bopp, L., Gehlen, M., Segschneider, J., Frolicher, T. L., Cadule, P., . . . Joos, F. (2008). Climate-induced interannual variability of marine primary and export production in three global coupled climate carbon cycle models. *Biogeosciences*, 5, 597-614.
- Schönhardt, A., Richter, A., Wittrock, F., Kirk, H., Oetjen, H., Roscoe, H. K., & Burrows, J. P. (2008). Observations of iodine monoxide columns from satellite. *Atmospheric Chemistry and Physics*, 8, 637-653.
- Scinocca, J. F., Reader, M. C., Plummer, D. A., Sigmond, M., Kushner, P. J., Shepherd, T. G., & Ravishankara, A. R. (2009). Impact of sudden Arctic sea-ice loss on stratospheric polar ozone recovery. *Geophysical Research Letters*, 36, L24701. doi: 10.1029/2009GL041239
- Seckmeyer, G., Glandorf, M., Wichers, C., McKenzie, R. L., Henriques, D., Carvalho, F., . . . Feister, U. (2008). Europe's darker atmosphere in the UV-B. *Photochemical & Photobiological Sciences*, 7, 925-930. doi: 10.1039/b804109a
- Seckmeyer, G., Mayer, B., Bernhard, G., Erb, R., Albold, A., Jäger, H., & Stockwell, W. R. (1997). New maximum UV irradiance levels observed in Central Europe. *Atmospheric Environment*, 31, 2971-2976.
- Seckmeyer, G., Pissulla, D., Glandorf, M., Henriques, D., Johnsen, B., Webb, A., . . . Carvalho, F. (2008). Variability of UV Irradiance in Europe. *Photochemistry and Photobiology*, 84(1), 172-179.
- Segura, A., Krellove, K., Kasting, J. F., Sommerlatt, D., Meadows, V., Crisp, D., . . . Mlawer, E. (2003). Ozone concentrations and ultraviolet fluxes on earth-like planets around other stars. *Astrobiology*, 3(4), 689-708.
- Seidel, D. J., Fu, Q., Randel, W. J., & Reichler, T. J. (2008). Widening of the tropical belt in a changing climate. *Nature Geoscience*, 1, 21-24. doi: 10.1038/ngeo.2007.38
- Setlow, R. B. (1974). The Wavelengths in Sunlight Effective in Producing Skin Cancer: A Theoretical Analysis. *Proceedings of the National Academy of Sciences of the United States of America*, 71(9), 3363-3366.
- Shaffer, J. A., & Cervený, R. S. (2004). Long-term (250,000 BP to 50,000 AP) variations in ultraviolet and

- visible radiation (0.175–0.690 μm). *Global and Planetary Change*, *41*, 111-120.
- Shepherd, J. G., & Jonsson, A. I. (2008). On the attribution of stratospheric ozone and temperature changes to changes in ozone-depleting substances and well-mixed greenhouse gases. *Atmospheric Chemistry and Physics*, *8*, 1435-1444.
- Shindell, D. (2008). Climate Change: Cool ozone. *Nature Geoscience (News & Views)*, *1*, 85-86.
- Shindell, D. T., Faluvegi, G., Koch, D. M., Schmidt, G. A., Unger, N., & Bauer, S. E. (2009). Improved attribution of climate forcing to emissions. *Science*, *326*(5953), 716-719. doi: 10.1126/science.1174760
- Shindell, D. T., & Schmidt, G. A. (2004). Southern Hemisphere climate response to ozone changes and greenhouse gas increases. *Geophysical Research Letters*, *31*(18), L18209
18210.11029/12004GL020724.
- Siani, A. M., Casale, G. R., Diémoz, H., G. Agnesod, Kimlin, M. G., Lang, C. A., & Colosimo, A. (2008). Personal UV exposure on a ski-field at an alpine site. *Atmospheric Chemistry and Physics*, *8*, 3749-3760.
- Siani, A. M., Casale, G. R., Sisto, R., Borra, M., Kimlin, M. G., Lang, C. A., & Colosimo, A. (2009). Short-term UV exposure of sunbathers at a Mediterranean Sea site. *Photochemistry and Photobiology*, *85*(1), 171-177.
- Siani, A. M., Galliani, A., & Casale, G. R. (2002). An investigation on a low ozone episode at the end of November 2000 and its effect on ultraviolet radiation. *Optical Engineering*, *41*(12), 3082-3089.
- Simmonds, P. G., Derwent, R. G., Manning, A. J., Fraser, P. J., Krummel, P. B., O'Doherty, S., . . . Salameh, P. K. (2005). AGAGE observations of methyl bromide and methyl chloride at Mace Head, Ireland, and Cape Grim, Tasmania, 1998-2001. *Journal of Atmospheric Chemistry*, *47*(3), 243 - 269.
- Sinnhuber, B.-M., Sheode, N., Sinnhuber, M., Chipperfield, M. P., & Feng, W. (2009). The contribution of anthropogenic bromine emissions to past stratospheric ozone trends: a modelling study. *Atmospheric Chemistry and Physics*, *9*(8), 2863-2871.
- Smythe-Wright, D., Boswell, S. M., Lucas, C. H., New, A. L., & Varney, M. S. (2005). Halocarbon and dimethylsulphide studies around the Mascarene Plateau: One contribution of 24 to a Discussion Meeting 'Atmosphere-ocean-ecology dynamics in the Western Indian Ocean'. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences*, *363*(1826), 169 - 185. doi: 10.1098/rsta.2004.1485
- Sola, Y., Lorente, J., Campmany, E., Cabo, X. d., Bech, J., Redano, A., . . . Badosa, J. (2008). Altitude effect in UV radiation during the Evaluation of the Effects of Elevation and Aerosols on the Ultraviolet Radiation 2002 (VELETA-2002) field campaign. *Journal of Geophysical Research*, *113*(D23202), doi:10.1029/2007JD009742.
- Solanki, S. K., Usoskin, I. G., Kromer, B., Schüssler, M., & Beer, J. (2004). Unusual activity of the Sun during recent decades compared to the previous 11,000 years. *Nature*, *431*, 1084-1087.
- Solanki, S. K., Usoskin, I. G., Kromer, B., Schüssler, M., & Beer, J. (2005). Solanki et al. Reply to: R. Muscheler et al. doi:10.1038/nature04045 (2005). *Nature*, *436*, E4-E5.
- Solomon, S. (2004). The hole truth: What's news (and what's not) about the ozone hole. *Nature*, *427*, 289-290.
- Solomon, S., & Albritton, D. L. (1992). Time-dependent ozone depletion potentials for short- and long-term forecasts. *Nature*, *357*, 33-37.
- Solomon, S., Portmann, R. W., Sasaki, T., Hofmann, D. J., & Thompson, D. W. J. (2005). Four decades of ozonesonde measurements over Antarctica. *Journal of Geophysical Research*, *110*(D21311), DOI:10.1029/2005JD005917.
- Son, S. W., Polvani, L. M., Waugh, D. W., Akiyoshi, H., Garcia, R., Kinnison, D., . . . Shibata, K. (2008). The Impact of Stratospheric Ozone Recovery on the Southern Hemisphere Westerly Jet. *Science*, *320*, 1486-1489. doi: 10.1126/science.1155939
- Son, S.-W., Tandon, N. F., Polvani, L. M., & Waugh, D. W. (2009). Ozone hole and Southern Hemisphere

- climate change. *Geophysical Research Letters*, 36, L15705. doi: 10.1029/2009GL038671
- SPARC CCMVal. (2010). *SPARC Report on the Evaluation of Chemistry-Climate Models*, V. Eyring, T. G. Shepherd, D. W. Waugh (Eds.), SPARC Report No. 5, WCRP-132, WMO/TD-No. 1526, <http://www.atmosphysics.utoronto.ca/SPARC>.
- Steinbacher, M., Vollmer, M. K., Buchmann, B., & Reimann, S. (2008). An evaluation of the current radiative forcing benefit of the Montreal Protocol at the high-Alpine site Jungfraujoch. *Science of the Total Environment*, 391, 217-223.
- Steinbrecht, W., Claude, H., Schönenborn, F., McDermid, I. S., Leblanc, T., Godin-Beekman, S., . . . Burrows, J. P. (2009). Ozone and temperature trends in the upper stratosphere at five stations of the Network for the Detection of Atmospheric Composition Change. *International Journal of Remote Sensing*, 30(15 & 16), 3875 - 3886 doi: 10.1080/01431160902821841
- Stick, C., Krüger, K., Schade, N. H., Sandmann, H., & Macke, A. (2006). Episode of unusual high solar ultraviolet radiation over central Europe due to dynamical reduced total ozone in May 2005. *Atmospheric Chemistry and Physics*, 6, 1771-1776.
- Still, C. J., Riley, W. J., Biraud, S. C., Noone, D. C., Buenning, N. H., Randerson, J. T., . . . Berry, J. A. (2009). Influence of clouds and diffuse radiation on ecosystem-atmosphere CO₂ and CO¹⁸O exchanges. *Journal of Geophysical Research*, 114, G01018. doi: 10.1029/2007JG000675.
- Stolarski, R. S., Bloomfield, P., McPeters, R. D., & Herman, J. R. (1991). Total ozone trends deduced from Nimbus-7 TOMS data. *Geophysical Research Letters*, 18(6), 1015-1018. doi: 10.1029/91GL01302
- Stolarski, R. S., & Frith, S. M. (2006). Search for evidence of trend slow-down in the long-term TOMS/SBUV total ozone data record: the importance of instrument drift uncertainty. *Atmospheric Chemistry and Physics*, 6, 4057-4065.
- Svensen, H., Schmidbauer, N., Roscher, M., Stordal, F., & Planke, S. (2009). Contact metamorphism, halocarbons, and environmental crises of the past. *Environmental Chemistry*, 6(6), 466-471 doi: 10.1071/EN09118
- Tanskanen, A., Krotkov, N., Herman, J., & Arola, A. (2006). Surface ultraviolet irradiance from OMI. *IEEE Transactions on Geoscience and Remote Sensing (Aura special issue)*, 44(5).
- Tanskanen, A., Lindfors, A., Maatta, A., Krotkov, N., Herman, J., Kaurola, J., . . . Tamminen, J. (2007). Validation of the daily erythemal UV doses from Ozone Monitoring Instrument with ground-based UV measurement data. *Journal of Geophysical Research*, 112(D24S44). doi: 10.1029/2007JD008830
- Temnerud, J., & Weyhenmeyer, G. A. (2008). Abrupt changes in air temperature and precipitation: Do they matter for water chemistry? *Global Biogeochemical Cycles*, 22, 8. doi: Gb2008
10.1029/2007gb003023
- Teysedre, H., Michou, M., Clark, H. L., Josse, B., Karcher, F., Olivie, D., . . . Cheroux, F. (2007). A new tropospheric and stratospheric Chemistry and Transport Model MOCAGE-Climat for multi-year studies: evaluation of the present-day climatology and sensitivity to surface processes. *Atmospheric Chemistry and Physics*, 7, 5815-5860.
- Thomas, H., Prowe, A. E. F., van Heuven, S., Bozec, Y., de Baar, H. J. W., Schiattecatte, L. S., . . . Doney, S. C. (2007). Rapid decline of the CO₂ buffering capacity in the North Sea and implications for the North Atlantic Ocean. *Global Biogeochemical Cycles*, 21, 13. doi: Gb4001
10.1029/2006gb002825
- Thompson, A. M., Huntley, M. A., & Stewart, R. W. (1990). Perturbations to tropospheric oxidants, 1985-2035 1. Calculations of ozone and OH in chemically coherent regions. *Journal of Geophysical Research*, 95(D7), 9829-9844. doi: 10.1029/JD095iD07p09829
- Thompson, A. M., Huntley, M. A., & Stewart, R. W. (1991). Perturbations to tropospheric oxidants, 1985-2035: 2. Calculations of hydrogen peroxide in chemically coherent regions. *Atmospheric Environment. Part A. General Topics*, 25(9), 1837-1850. doi: 10.1016/0960-1686(91)90267-B

- Thompson, D. W. J., & Solomon, S. (2002). Interpretation of recent Southern Hemisphere climate change. *Science*, 296(5569), 895-899.
- Tilmes, S., Müller, R., & Salawitch, R. (2008). The Sensitivity of Polar Ozone Depletion to Proposed Geoengineering Schemes. *Science*, 320(3 May), 1201-1204.
- Toole, D. A., & Siegel, D. A. (2004). Light-driven cycling of dimethylsulfide (DMS) in the Sargasso Sea: Closing the loop. *Geophysical Research Letters*, 31(9), L09308. doi: 10.1029/2004GL019581
- Toole, D. A., Siegel, D. A., & Doney, S. C. (2008). A light-driven, one-dimensional dimethylsulfide biogeochemical cycling model for the Sargasso Sea. *Journal of Geophysical Research-Biogeosciences*, 113, 20. doi: G02009
10.1029/2007jg000426
- Toon, O. B., & Turco, R. P. (1991). Polar stratospheric clouds and ozone depletion. *Scientific American*, 264(6), 68-74.
- Tourpali, K., Bais, A. F., Kazantzidis, A., Zerefos, C. S., Akiyoshi, H., Austin, J., . . . Tian, W. (2009). Clear sky UV simulations for the 21st century based on ozone and temperature projections from chemistry-climate models. *Atmospheric Chemistry and Physics*, 9(4), 1165-1172. doi: 10.5194/acp-9-1165-2009
- Tourpali, K., Schuurmans, C. J. E., van Dorland, R., Steil, B., Bruhl, C., & Manzini, E. (2005). Solar cycle modulation of the Arctic Oscillation in a chemistry-climate model. *Geophysical Research Letters*, 32(L17803), DOI:10.1029/2005GL023509.
- Trenberth, K. E., & Fasullo, J. T. (2009). Global warming due to increasing absorbed solar radiation. *Geophysical Research Letters*, 36, L07706. doi: 10.1029/2009GL037527
- Trepte, S., & Winkler, P. (2004). Reconstruction of erythemal UV irradiance and dose at Hohenpeissenberg (1968-2001) considering trends of total ozone, cloudiness and turbidity. *Theoretical and Applied Climatology*, 77 (3-4), 159-171.
- Tsigaridis, K., Krol, M., Dentener, F. J., Balkanski, Y., Lathière, J., Metzger, S., . . . Kanakidou, M. (2006). Change in global aerosol composition since preindustrial times. *Atmospheric Chemistry and Physics*, 6, 5143-5162.
- UNEP Environmental Effects Assessment Panel. (1998). Environmental effects of ozone depletion: 1998 assessment. *Journal of Photochemistry and Photobiology*, 46(Special issue), 5-19 (ch11).
- UNEP Environmental Effects Assessment Panel. (1998). *Environmental effects of ozone depletion: 1998 assessment*. Nairobi: UNEP.
- UNEP Environmental Effects Assessment Panel. (2003). Environmental effects of ozone depletion and its interactions with climate change: 2002 assessment. *Photochemical & Photobiological Sciences*, 2(1, UNEP Special Issue), 1-72.
- UNEP Environmental Effects Assessment Panel. (2003). *Environmental effects of ozone depletion and its interactions with climate change: 2003 progress report*. Nairobi: United Nations Environment Programme (UNEP).
- UNEP Environmental Effects Assessment Panel. (2007). Environmental effects of ozone depletion and its interactions with climate change: 2006 assessment. *Photochemical & Photobiological Sciences*, 6(3, UNEP Special Issue), 201-332.
- UNEP Environmental Effects Assessment Panel. (2008). Environmental effects of ozone depletion and its interactions with climate change: Progress report, 2007. [rev]. *Photochemical & Photobiological Sciences*, 7, 15-27, DOI: 10.1039/b717166h.
- UNEP Environmental Effects Assessment Panel. (2009). Environmental effects of ozone depletion and its interactions with climate change: Progress report, 2008. [rev]. *Photochemical & Photobiological Sciences*, 8, 13-22, DOI: 10.1039/b820432m. doi: DOI: 10.1039/b820432m
- UNEP Environmental Effects Assessment Panel. (2010). Environmental effects of ozone depletion and its interactions with climate change: Progress report, 2009. [rev]. *Photochemical & Photobiological*

Sciences, **, **. doi: DOI: 10.1039/b820432m

- The Vienna Convention for the Protection of the Ozone Layer (1985).
- The Montreal Protocol on Substances That Deplete the Ozone Layer (1987).
- Velders, G. J. M., Andersen, S. O., Daniel, J. S., Fahey, D. W., & McFarland, M. (2007). The importance of the Montreal Protocol in protecting climate. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(12), 4814–4819.
- Velders, G. J. M., Fahey, D. W., Daniel, J. S., McFarland, M., & Andersen, S. O. (2009). The large contribution of projected HFC emissions to future climate forcing. *Proceedings of the National Academy of Sciences of the United States of America*, *106*(27), 10949-10954. doi: 10.1073/pnas.0902817106
- Verdebut, J. (2000). A method to generate surface UV radiation maps over Europe using GOME, Meteosat, and ancillary geophysical data. *Journal of Geophysical Research*, *105*(D4), 5049-5058.
- Verleyen, E., Hodgson, D. A., Sabbe, K., & Vyverman, W. (2005). Late Holocene changes in ultraviolet radiation penetration recorded in an East Antarctic lake. *Journal of Paleolimnology*, *34*(2), 191-202.
- Vigano, I., van Weelden, H., Holzinger, R., Keppler, F., McLeod, A., & Rockmann, T. (2008). Effect of UV radiation and temperature on the emission of methane from plant biomass and structural components. *Biogeosciences*, *5*, 937-947.
- Visscher, H., Looy, C. V., Collinson, M. E., Brinkhaus, H., van Konijnenburg-van Cittert, J. H. A., Kürschner, W. M., & Sephton, M. (2004). Environmental mutagenesis during the end-Permian ecological crisis. *Proceedings of the National Academy of Sciences of the United States of America*, *101*, 12952-12956.
- Vojnikovic, B., Njiric, S., Coklo, M., Toth, I., Spanjol, J., & Marinovic, M. (2007). Sunlight and incidence of pterygium on Croatian Island Rab-epidemiological study. *Collegium Anthropologica*, *31 Suppl 1*, 61-62.
- Volynchik, S., Plotkin, M., Bergman, D. J., & Ishay, J. S. (2008). Hornet flight activity and its correlation with UVB radiation, temperature and relative humidity. *Photochemistry and Photobiology*, *84*, 81-85.
- von Glasow, R. (2008). Atmospheric chemistry - Sun, sea and ozone destruction. *Nature*, *453*, 1195-1196. doi: 10.1038/4531195a
- von Glasow, R., Kuhlmann, R. v., Lawrence, M. G., Platt, U., & Crutzen, P. J. (2004). Impact of reactive bromine chemistry in the troposphere. *Atmospheric Chemistry and Physics*, *4*, 2481-2497.
- Vyushin, D., Fioletov, V. E., & Shepherd, T. G. (2007). Impact of long-range correlations on trend detection in total ozone. *Journal of Geophysical Research*, *112*(D14307), doi:10.1029/2006JD008168.
- Walser, M. L., Park, J., Gomez, A. L., Russell, A. R., & Nizkorodov, S. A. (2007). Photochemical aging of secondary organic aerosol particles generated from the oxidation of d-Limonene. *Journal of Physical Chemical A*, *111*, 1907-1913.
- Waugh, D. W., Oman, L., Kawa, S. R., Stolarski, R. S., Pawson, S., Douglass, A. R., . . . Nielsen, J. E. (2009). Impacts of climate change on stratospheric ozone recovery. *Geophysical Research Letters*, *36*, L03805. doi: 10.1029/2008GL036223
- Weatherhead, B., Tanskanen, A., & Stevermer, A. (2005). Chapter 5. Atmospheric ozone and UV radiation *ACIA [Arctic Climate Impact Assessment] Scientific Report* (pp. 151-182).
- Weatherhead, E. C., & Anderson, S. B. (2006). The search for signs of recovery of the ozone layer. *Nature*, *441*(May), 39-45.
- Weatherhead, E. C., Reinsel, G. C., Tiao, G. C., Jackman, C. H., Bishop, L., Frith, S. M. H., . . . Frederick, J. E. (2000). Detecting the recovery of total column ozone. *Journal of Geophysical Research*, *105*(D17), 22201-22210.
- Webb, A. R., & Engelsen, O. (2006). Calculated ultraviolet exposure levels for a healthy vitamin D status. *Photochemistry and Photobiology*, *82*, 1697-1703.
- Webb, A. R., Kline, L., & Holick, M. F. (1988). Influence of season and latitude on the cutaneous synthesis of vitamin D3: Exposure to winter sunlight in Boston and Edmonton will not promote vitamin D3

- synthesis in human skin. *Journal of Clinical Endocrinology and Metabolism*, 67(2), 373-378.
- Wennberg, P. O., & Dabdub, D. (2008). Atmospheric chemistry - Rethinking ozone production. *Science*, 319, 1624-1625. doi: 10.1126/science.1155747
- West, J. J., Fiore, A. M., Naik, V., Horowitz, L. W., Schwarzkopf, M. D., & Mauzerall, D. L. (2007). Ozone air quality and radiative forcing consequences of changes in ozone precursor emissions. *Geophysical Research Letters*, 34, L06806. doi: doi:10.1029/2006GL029173
- Whalin, L., Kim, E.-H., & Mason, R. (2007). Factors influencing the oxidation, reduction, methylation and demethylation of mercury species in coastal waters. *Marine Chemistry*, 107, 278-294.
- Wild, M. (2009). Global dimming and brightening: A review. *Journal of Geophysical Research*, 114(D00D16), 10.1029/2008JD011470.
- Wild, M., Gilgen, H., Roesch, A., Ohmura, A., Long, C. N., Dutton, E. G., . . . Tsvetkov, A. (2005). From dimming to brightening: Decadal changes in solar radiation at Earth's surface. *Science*, 308(5723), 847-850.
- Willey, J. D., Kieber, R. J., Seaton, P. J., & Miller, C. (2008). Rainwater as a source of Fe(II)-stabilizing ligands to seawater. *Limnology and Oceanography*, 53, 1678-1684.
- Williams, M. B., Aydin, M., Tatum, C., & Saltzman, E. S. (2007). A 2000 year atmospheric history of methyl chloride from a South Pole ice core: Evidence for climate controlled variability. *Geophysical Research Letters*, 34(L07811), doi:10.1029/2006GL029142. doi: 10.1029/2006GL029142
- Williams, M. B., Aydin, M., Tatum, C., & Saltzman, E. S. (2007). A 2000 year atmospheric history of methyl chloride from a South Pole ice core: Evidence for climate controlled variability. *Geophysical Research Letters*, 34, L07811, doi:07810.01029/02006GL029142.
- Wilson, S. R., Solomon, K. R., & Tang, X. (2007). Changes in tropospheric composition and air quality due to stratospheric ozone depletion and climate change. *Photochemical & Photobiological Sciences*, 6, 301-310. doi: 10.1039/B700022G
- Wingenter, O. W., Haase, K. B., Strutton, P., Friederich, G., Meinardi, S., Blake, D. R., & Rowland, F. S. (2004, 8 June 2004). *Changing concentrations of CO, CH₄, C₅H₈, CH₃Br, CH₃I, and dimethyl sulfide during the southern ocean iron enrichment experiments*. Paper presented at the Proceedings of the National Academy of Sciences of the USA.
- Winiacki, S., and J. E. Frederick. (2005). Ultraviolet radiation and clouds: Couplings to tropospheric air quality. *Journal of Geophysical Research*, 110, D22202, DOI:22210.21029/22005JD006199.
- Witt, M. L. I., Skrabal, S., Kieber, R., & Willey, J. (2007). Photochemistry of Cu complexed with chromophoric dissolved organic matter: implications for Cu speciation in rainwater. *Journal of Atmospheric Chemistry*, 58, 89-109. doi: 10.1007/s10874-007-9079-5
- World Health Organisation (WHO). (2002). *Global solar UV Index: A practical guide* (pp. 28). Geneva: World Health Organisation (WHO), World Meteorological Organisation (WMO), United Nations Environment Program (UNEP), and International Commission on Non-Ionising Radiation Protection (ICNRP).
- World Meteorological Organisation. (2003). *Scientific Assessment of Ozone Depletion: 2002*. In D. L. Albritton, A.-L. Ajavon, M. G. & R. T. Watson (Eds.), *Global Ozone Research and Monitoring Project report Number 47* (pp. 498). Geneva: World Meteorological Organisation.
- World Meteorological Organisation. (2007). *Scientific Assessment of Ozone Depletion: 2006*. In A.-L. Ajavon, D. L. Albritton & R. T. Watson (Eds.), (Vol. *Global Ozone Research and Monitoring Project - Report No. 50*). Geneva: World Meteorological Organisation.
- World Meteorological Organisation. (2011). *Scientific Assessment of Ozone Depletion: 2010*. In A.-L. Ajavon, P. A. Newman, J. A. Pyle & A. R. Ravishankara (Eds.). Geneva: World Meteorological Organisation.
- Wright, C. Y., Reeder, A. I., Bodeker, G. E., Gray, A., & Cox, B. (2007). Solar UVR exposure, concurrent activities and sun-protective practices among primary schoolchildren. *Photochemistry and*

- Photobiology*, 83, 749-758.
- Wu, S., Mickley, L. J., Leibensperger, E. M., Jacob, D. J., Rind, D., & Streets, D. G. (2008). Effects of 2000-2050 global change on ozone air quality in the United States. *Journal of Geophysical Research-Atmospheres*, 113, D06302. doi: 10.1029/2007JD008917
- Wuebbles, D. J. (1983). Chlorocarbon emission scenarios: Potential impact on stratospheric chlorine. *Journal of Geophysical Research*, 88(C2), 1433-1443. doi: 10.1029/JC088iC02p01433
- Wuttke, S., & Seckmeyer, G. (2005). Spectral radiance and sky luminance in Antarctica: a case study. *Theoretical and Applied Climatology*, doi:10.1007/s00704-005-0188-2. doi: 10.1007/s00704-005-0188-2
- Xia, X., Li, Z., Wang, P., Cribb, M., Chen, H., & Zhao, Y. (2008). Analysis of relationships between ultraviolet radiation (295–385 nm) and aerosols as well as shortwave radiation in North China Plain. *Annals of Geophysics*, 26, 2043-2052.
- Xiao, X., Prinn, R. G., Fraser, P. J., Simmonds, P. G., Weiss, R. F., O'Doherty, S., . . . Yokouchi, Y. (2010). Optimal estimation of the surface fluxes of methyl chloride using a 3-D global chemical transport model *Atmospheric Chemistry and Physics*, 10, 5515-5533. doi: 10.5194/acp-10-5515-2010
- Yang, E. S., Cunnold, D. M., Newchurch, M. J., Salawitch, R. J., McCormick, M. P., J.M. Russell, I., . . . Oltmans, S. J. (2008). First stage of Antarctic ozone recovery. *Journal of Geophysical Research*, 113, D20308. doi: 10.1029/2007JD009675
- Yang, E.-S., Cunnold, D., Salawitch, R., McCormick, P., Russell III, J. M., Zawodny, J., . . . Newchurch, M. J. (2006). Attribution of recovery in lower-stratospheric ozone. *Journal of Geophysical Research*, 111(D17309), DOI:10.1029/2005JD006371.
- Yang, X., Pyle, J. A., & Cox, R. A. (2008). Sea salt aerosol production and bromine release: Role of snow on sea ice. *Geophysical Research Letters*, 35(L16815), doi:10.1029/2008GL034536.
- Yokouchi, Y., Ikeda, M., Inuzuka, Y., & Yukawa, T. (2002). Strong emission of methyl chloride from tropical plants. *Nature*, 416, 163-165.
- Zeng, G., & Pyle, J. A. (2005). Influence of El Nino Southern Oscillation on stratosphere//troposphere exchange and the global tropospheric ozone budget. *Geophysical Research Letters*, 32(L01814), DOI:10.1029/2004GL021353.
- Zepp, R. G., Erickson, D. J., Paul, N. D., & Sulzberger, B. (2007). Interactive effects of solar UV radiation and climate change on biogeochemical cycling. *Photochemical & Photobiological Sciences*, 6, 286-300.
- Zerefos, C., Balis, D., Tzortziou, M., Bais, A., Tourpali, K., C. Meleti, . . . J. Herman. (2001). A note on the interannual variations of UV-B erythemal doses and solar irradiance from ground-based and satellite observations. *Annals of Geophysics*, 19(1), 115-120.
- Zerefos, C., Eleftheratos, K., Meleti, C., Kazadtzis, S., Romanou, A., Ichoku, C., . . . Bais, A. (2009). Solar dimming and brightening over Thessaloniki, Greece, and Beijing, China. *Tellus*, 61(4), 657-665. doi: 10.1111/j.1600-0889.2009.00425.x
- Zerefos, C. S. (2002). Long-term ozone and UV variations at Thessaloniki, Greece. *Physics and Chemistry of the Earth*, 27(6-8), 455-460.
- Zerefos, C. S., Meleti, C., Balis, D. S., Bais, A. F., & Gillotay, D. (2001). On changes of spectral UV-B in the 90's in Europe. *Advances in Space Research*, 26(12), 1971-1978.
- Ziemke, J. R., Chandra, S., & Bhartia, P. K. (2005). A 25-year data record of atmospheric ozone in the Pacific from Total Ozone Mapping Spectrometer (TOMS) cloud slicing: Implications for ozone trends in the stratosphere and troposphere. *Journal of Geophysical Research*, 110(D15105), DOI: 10.1029/2004JD00568.
- Ziolkowski, L. A., & Miller, A. J. (2007). Variability of the apparent quantum efficiency of CO photoproduction in the Gulf of Maine and Northwest Atlantic. *Marine Chemistry*, 105, 258-270.
- Zuev, V. V., & Bondarenko, S. L. (2003). Reconstruction of multicentennial behavior of the total ozone content based on dendrochronological data. *Doklady Earth Sciences*, 393(8), 1120-1123.