

# The Sun-Climate Effect: The Winter Gatekeeper Hypothesis

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### Bibliography

- Abarca del Río R, Gambis D, Salstein D et al (2003) Solar activity and earth rotation variability. *Journal of Geodynamics* 36 (3) 423–443
- Abarca del Río R & Gambis D (2011) Revisiting a possible relationship between solar activity and Earth rotation variability. In: Capitaine N (ed) *Proceedings of the Journées 2010 "Systèmes de référence spatio-temporels."* Observatoire de Paris pp 194–195
- Abbot CG (1957) Weather and solar variation. *Solar Energy* 1 (1) 3–5
- Abreu JA, Beer J & Ferriz-Mas A (2010) Past and future solar activity from cosmogenic radionuclides. In: Cranmer SR, Hoeksema JT and Kohl JL (eds) *SOHO-23: understanding a peculiar solar minimum.* ASP Conference Series 428 p 287
- Álvarez-Ramírez J, Echeverría JC & Rodríguez E (2011) Is the North Atlantic Oscillation modulated by solar and lunar cycles? Some evidences from Hurst autocorrelation analysis. *Advances in Space Research* 47 (4) 748–756
- Ammann B & Fyfe RM (2014) Blytt-Sernander timescale. In: Matthews JA (ed) *Encyclopedia of Environmental Change.* SAGE, London, p 107. <https://doi.org/10.4135/9781446247501.n457>
- Anderson RY (1990) Solar-cycle modulations of ENSO: a possible source of climatic change. In: Betancourt JL and MacKay AM (eds) *Proceedings of the Sixth Annual Pacific Climate (PACLIM) Workshop, March 5–8, 1989: California Department of Water Resources, Interagency Ecological Studies Program Technical Report 23* 77–81
- Azoulay A, Schmidt H & Timmreck C (2021) The Arctic polar vortex response to volcanic forcing of different strengths. *Journal of Geophysical Research: Atmospheres* 126 (11) e2020JD034450
- Baldwin MP & Dunkerton TJ (1998) Biennial, quasi-biennial, and decadal oscillations of potential vorticity in the northern stratosphere. *Journal of Geophysical Research: Atmospheres* 103 (D4) 3919–3928
- Baldwin MP, Birner T, Brasseur G et al (2019) 100 years of progress in understanding the stratosphere and mesosphere. *Meteorological Monographs* 59 27–1
- Barlyaeva T, Bard E & Abarca del Río R (2014) Rotation of the Earth, solar activity and cosmic ray intensity. *Annales Geophysicae* 32 (7) 761–771
- Barry L, Craig GC & Thurn J (2002) Poleward heat transport by the atmospheric heat engine. *Nature* 415 (6873) 774–777
- Bednarz EM, Maycock AC, Braesicke P et al (2019) Separating the role of direct radiative heating and photolysis in modulating the atmospheric response to the amplitude of the 11-year solar cycle forcing. *Atmospheric Chemistry and Physics* 19 (15) 9833–9846
- Berling DJ & Royer DL (2011) Convergent Cenozoic CO<sub>2</sub> history. *Nature Geoscience* 4 (7) 418–420
- Berger JF, Delhon C, Magnin F et al (2016) A fluvial record of the mid-Holocene rapid climatic changes in the middle Rhone valley (Espeluche-Lalo, France) and of their impact on Late Mesolithic and Early Neolithic societies. *Quaternary Science Reviews* 136 66–84
- Bevan A, Colledge S, Fuller D et al (2017) Holocene fluctuations in human population demonstrate repeated links to food production and climate. *Proceedings of the National Academy of Sciences* 114 (49) E10524–E10531
- Björck S, Rundgren M, Ingólfsson O & Funder S (1997) The Preboreal oscillation around the Nordic Seas: terrestrial and lacustrine responses. *Journal of Quaternary Science* 12 (6) 455–465
- Björck S, Muscheler R, Kromer B et al (2001) High-resolution analyses of an early Holocene climate event may imply decreased solar forcing as an important climate trigger. *Geology* 29 (12) 1107–1110
- Blunier T, Chappellaz J, Schwander J et al (1995) Variations in atmospheric methane concentration during the Holocene epoch. *Nature* 374 (6517) p46–49
- Boden TA, Marland G & Andres RJ (2009) Global, regional, and national fossil-fuel CO<sub>2</sub> emissions. Carbon dioxide information analysis center, Oak ridge national laboratory, US department of energy. Doi 10.3334/CDIAC/00001\_V2010
- Bond G, Kromer B, Beer J et al (2001) Persistent solar influence on North Atlantic climate during the Holocene. *Science* 294 (5549) 2130–2136
- Bosmans JHC, Hilgen FJ, Tüenter E & Lourens LJ (2015) Obliquity forcing of low-latitude climate. *Climate of the Past* 11 (10) 1335–1346
- Bray JR (1968) Glaciation and solar activity since the fifth century BC and the solar cycle. *Nature* 220 (5168) 672–674
- Broecker WS, Bond G, Klas M et al (1990) A salt oscillator in the glacial Atlantic? 1 The concept. *Paleoceanography* 5 (4) 469–477
- Calvo N & Marsh DR (2011) The combined effects of ENSO and the 11 year solar cycle on the Northern Hemisphere polar stratosphere. *Journal of Geophysical Research: Atmospheres* 116 (D23)

- Campbell BM & Ó Gráda C (2011) Harvest shortfalls grain prices and famines in preindustrial England. *The Journal of Economic History* 71 (4) 859–886
- Carlson B, Laci A, Colose C et al (2019) Spectral signature of the Biosphere: NISTAR finds it in our solar system from the Lagrangian L-1 point. *Geophysical Research Letters* 46 (17–18) 10679–10686
- Carter RM (2006) There IS a problem with global warming... it stopped in 1998. *The Telegraph* [<https://www.telegraph.co.uk/comment/personal-view/3624242/There-IS-a-problem-with-global-warming...-it-stopped-in-1998.html>] Accessed 25 February 2022
- Cea Pirón MA & Cano Pasalodos JA (2016) Nueva serie de extensión del hielo marino ártico en septiembre entre 1935 y 2014. *Revista de Climatología* 16 1–19
- Challinor RA (1971) Variations in the rate of rotation of the Earth. *Science* 172 (3987) 1022–1025
- Chambers FM, Mauquoy D & Brain SA (2007) Globally synchronous climate change 2800 years ago: proxy data from peat in South America. *Earth and Planetary Science Letters* 253 (3–4) 439–444
- Chappellaz J, Stowasser C, Blunier T et al (2013) High-resolution glacial and deglacial record of atmospheric methane by continuous-flow and laser spectrometer analysis along the NEEM ice core. *Climate of the Past* 9 (6) 2579–2593
- Chavez FP, Ryan J, Lluch-Cota SE & Niquen M (2003) From anchovies to sardines and back: multidecadal change in the Pacific Ocean. *Science* 299 (5604) 217–221
- Chen L, Francis J & Hanna E (2018) The “Warm-Arctic/Cold-continents” pattern during 1901–2010. *International Journal of Climatology* 38 (14) 5245–5254
- Chen X & Tung KK (2014) Varying planetary heat sink led to global-warming slowdown and acceleration. *Science* 345 (6199) 897–903
- Chiswell SM (2021) Atmospheric wavenumber-4 driven South Pacific marine heat waves and marine cool spells. *Nature Communications* 12 (1) 1–8
- Christiansen B (2010) Stratospheric bimodality: Can the equatorial QBO explain the regime behavior of the NH winter vortex?. *Journal of climate* 23 (14) 3953–3966
- Chylek P, Folland C, Frankcombe L et al (2012) Greenland ice core evidence for spatial and temporal variability of the Atlantic Multidecadal Oscillation. *Geophysical Research Letters* 39 (9)
- Chylek P, Klett JD, Lesins G et al (2014) The Atlantic Multidecadal Oscillation as a dominant factor of oceanic influence on climate. *Geophysical research letters* 41 (5) 1689–1697
- Cionco RG, Soon WWH & Quaranta NE (2020a) On the calculation of latitudinal insolation gradients throughout the Holocene. *Advances in Space Research* 66 (3) 720–742
- Cionco RG, Soon WWH, Elias AG & Quaranta NE (2020) Latitudinal insolation gradients throughout the Holocene II–High frequency variations. *Advances in Space Research* 66 (8) 1992–2000
- Cohen J, Zhang X, Francis J et al (2020) Divergent consensus on Arctic amplification influence on midlatitude severe winter weather. *Nature Climate Change* 10 (1) 20–29
- Collimore CC, Martin DW, Hitchman MH et al (2003) On the relationship between the QBO and tropical deep convection. *Journal of climate* 16 (15) 2552–2568
- Connolly R, Soon W, Connolly M et al (2021) How much has the Sun influenced Northern Hemisphere temperature trends? An ongoing debate. *Research in Astronomy and Astrophysics* 21 (6) 131
- Cook ER, Meko DM & Stockton CW (1997) A new assessment of possible solar and lunar forcing of the bidecadal drought rhythm in the western United States. *Journal of Climate* 10 (6) 1343–1356
- Cullen HM, deMenocal PB, Hemming S et al (2000) Climate change and the collapse of the Akkadian empire: Evidence from the deep sea. *Geology* 28 (4) 379–382
- Currie RG (1980) Detection of the 11-yr sunspot cycle signal in Earth rotation. *Geophysical Journal International* 61 (1) 131–140
- Currie RG (1993) Luni-solar 18.6-and solar cycle 10–11-year signals in USA air temperature records. *International Journal of Climatology* 13 (1) 31–50
- Curry JA, Schramm JL, Rossow WB & Randall D. (1996) Overview of Arctic cloud and radiation characteristics. *Journal of Climate* 9 (8) 1731–1764
- Damon PE & Sonett CP (1991) Solar and terrestrial components of the atmospheric <sup>14</sup>C variation spectrum. In Sonett CP, Giampapa MS & Matthews MS (eds) *The Sun in Time*. Tucson, Univ. of Arizona Press 360–388
- Danish Meteorological Institute (2021) [http://ocean.dmi.dk/arctic/meant80n\\_anomaly.uk.php](http://ocean.dmi.dk/arctic/meant80n_anomaly.uk.php) accessed 19 November 2021
- Dansgaard W, Johnsen SJ, Clausen HB et al (1984) North Atlantic climatic oscillations revealed by deep Greenland ice cores. In: Hansen JE & Takahashi T (eds) *Climate processes and climate sensitivity* 29 288–298. John Wiley & Sons Inc. New York
- Datseris G & Stevens B (2021) Earth’s albedo and its symmetry. *AGU Advances* 2 (3) e2021AV000440
- Davis BA & Brewer S (2011) A unified approach to orbital, solar, and lunar forcing based on the Earth’s latitudinal insolation/temperature gradient. *Quaternary Science Reviews* 30 (15–16) 1861–1874
- de Larminat P (2016) Earth climate identification vs. anthropic global warming attribution. *Annual Reviews in Control* 42 114–125
- Deser C, Alexander MA, Xie SP & Phillips AS (2010) Sea surface temperature variability: Patterns and mechanisms. *Annual review of marine science* 2 115–143

- Dewitte S & Clerbaux N (2018) Decadal changes of earth's outgoing longwave radiation. *Remote Sensing* 10 (10) 1539
- Dewitte S, Clerbaux N & Cornelis J (2019) Decadal changes of the reflected solar radiation and the earth energy imbalance. *Remote Sensing* 11 663
- Dokken TM, Nisancioglu KH, Li C et al (2013) Dansgaard-Oeschger cycles: Interactions between ocean and sea ice intrinsic to the Nordic seas. *Paleoceanography and Paleoclimatology* 28 (3) 491–502
- Domeisen DI, Garfinkel CI & Butler AH (2019) The teleconnection of El Niño Southern Oscillation to the stratosphere. *Reviews of Geophysics* 57 (1) 5–47
- Douglass AE (1919) Climatic cycles and tree-growth. A Study of the annual rings of trees in relation to climate and solar activity. Carnegie Institution of Washington. Washington
- Dübal HR & Vahrenholt F (2021) Radiative Energy Flux Variation from 2001–2020. *Atmosphere* 12 (10) 1297
- Dukhovskoy DS, Yashayaev I, Proshutinsky A et al (2019) Role of Greenland freshwater anomaly in the recent freshening of the subpolar North Atlantic. *Journal of Geophysical Research: Oceans* 124 (5) 3333–3360
- Duncombe J (2022) The surprising reach of Tonga's giant atmospheric waves. *Eos* 103. <https://doi.org/10.1029/2022EO220050>
- Eade R, Stephenson DB, Scaife AA & Smith DM (2021) Quantifying the rarity of extreme multi-decadal trends: how unusual was the late twentieth century trend in the North Atlantic Oscillation?. *Climate Dynamics* DOI 10.1007/s00382-021-05978-4
- Ebbesmeyer CC, Cayan DR, McLain DR et al (1991) 1976 step in the Pacific climate: forty environmental changes between 1968–1975 and 1977–1984. In: Betancourt JL and Tharp VL (eds) *Proceedings of the Seventh Annual Pacific Climate (PACLIM) Workshop, April 1990: California Department of Water Resources, Interagency Ecological Studies Program Technical Report 26* 115–126
- Eddy JA (1976) The Maunder Minimum. *Science* 192 (4245) 1189–1202
- Eddy JA (1977) Climate and the changing sun. *Climatic Change* 1 (2) 173–190
- Eddy JA, Gilliland RL & Hoyt DV (1982) Changes in the solar constant and climatic effects. *Nature* 300 (5894) 689–693
- Eddy JA, Bond GC, Bradley RS et al (2003) *Living with a Star: New Opportunities in Sun-Climate Research*. Report of the NASA LWS Sun-Climate Task Group
- Elsbury D, Peings Y & Magnusdottir G (2021) Variation in the Holton–Tan effect by longitude. *Quarterly Journal of the Royal Meteorological Society* 147 (736) 1767–1787
- Engels S & Van Geel B (2012) The effects of changing solar activity on climate: contributions from palaeoclimatological studies. *Journal of Space Weather and Space Climate* 2 p.A09
- Feynman R (1981) In: "Feynman: The Pleasure of Finding Things Out" BBC Horizon, Series 18, episode 9 (23 November 1981) <https://vimeo.com/340695809>
- Fleitmann D, Burns SJ, Mangini A et al (2007) Holocene ITCZ and Indian monsoon dynamics recorded in stalagmites from Oman and Yemen (Socotra). *Quaternary Science Reviews* 26 (1-2) 170-188
- Folland CK, Parker DE & Kates FE (1984) Worldwide marine temperature fluctuations 1856–1981. *Nature* 310 (5979) 670–673
- Frankcombe LM, Von Der Heydt A & Dijkstra HA (2010) North Atlantic multidecadal climate variability: an investigation of dominant time scales and processes. *Journal of climate* 23 (13) 3626–3638
- Fraser NJ & Cunningham SA (2021) 120 Years of AMOC variability reconstructed from observations using the Bernoulli inverse. *Geophysical Research Letters* 48 (18) e2021GL093893
- Fries M (1956) "Fimbulvintern" ur vegetations-historisk synpunkt. *Fornvännen* 51 5-10
- Fyfe JC, Meehl GA, England MH et al (2016) Making sense of the early-2000s warming slowdown. *Nature Climate Change* 6 (3) 224–228
- Gambis D & Bourget M (1993) Correlation between the 11-year solar cycle, the atmosphere angular momentum and the Earth rotation. *Annales Geophysicae* 11 (s. III) C368
- Geller MA & Alpert JC (1980) Planetary wave coupling between the troposphere and the middle atmosphere as a possible sun-weather mechanism. *Journal of Atmospheric Sciences* 37 (6) 1197–1215
- Goode PR & Pallé E (2007) Shortwave forcing of the Earth's climate: Modern and historical variations in the Sun's irradiance and the Earth's reflectance. *Journal of Atmospheric and Solar-Terrestrial Physics* 69 (13) 1556–1568
- Graham NE (1994) Decadal-scale climate variability in the tropical and North Pacific during the 1970s and 1980s: Observations and model results. *Climate Dynamics* 10 (3) 135–162
- Gray LJ, Beer J, Geller M et al (2010) Solar influences on climate. *Reviews of Geophysics* 48 (4) RG4001
- Gruzdev AN (2017) Variations in the temperature and circulation of the atmosphere during the 11-year cycle of solar activity derived from the ERA-Interim reanalysis data. *Izvestiya, Atmospheric and Oceanic Physics* 53 (4) 441-448.
- Guðlaugsdóttir H, Sjolte J, Sveinbjörnsdóttir ÁE et al (2019) North Atlantic weather regimes in δ18O of winter precipitation: isotopic fingerprint of the response in the atmospheric circulation after volcanic eruptions. *Tellus B: Chemical and Physical Meteorology* 71 (1) 1633848
- Haas R & Scherneck HG (2004) The IVS Analysis Center at the Onsala Space Observatory. In: Vandenberg NR and Baver KD (eds) *International VLBI Service for Geodesy and Astrometry, 2003 Annual Report by NASA/TP-2004-212254*
- Haigh JD (1996) The impact of solar variability on climate. *Science* 272 (5264) 981–984

- Haigh JD (2010) Solar variability and the stratosphere. In: Polvani LM, Sobel AH & Waugh DW (eds) *The Stratosphere: Dynamics, Transport, and Chemistry*. American Geophysical Union Geophysical Monograph Series 190 173-187 Washington DC
- Hartmann DL (1994) *Global physical climatology* (1st ed). Academic Press, San Diego
- Hartmann DL (2016) *Global physical climatology*. 2nd ed. Elsevier, Amsterdam
- Hayakawa H, Mitsuma Y, Ebihara Y & Miyake F (2019) The earliest candidates of auroral observations in Assyrian Astrological Reports: Insights on solar activity around 660 BCE. *The Astrophysical Journal Letters* 884 (1) L18
- Herman JR & Goldberg RA (1978) *Sun, Weather, and Climate*. NASA SP-426. Scientific and Technical Information Office. Washington DC.
- Haynes P (2005) Stratospheric dynamics. *Annual Review of Fluid Mechanics* 37 263–293
- Herschel W (1801) Observations tending to investigate the nature of the Sun, in order to find the causes or symptoms of its variable emission of light and heat; with remarks on the use that may possibly be drawn from solar observations. *Philosophical Transactions of the Royal Society of London* 91 XIII 265–318
- Hide R, Boggs DH & Dickey JO (2000) Angular momentum fluctuations within the Earth's liquid core and torsional oscillations of the core–mantle system. *Geophysical Journal International* 143 (3) 777-786
- Hildebrand JH (1957) *Science in the Making*. Columbia University Press. New York
- Hines CO (1974) A possible mechanism for the production of sun–weather correlations. *Journal of the Atmospheric Sciences* 31 (2) 589–591
- Holton JR (1982) Possible Physical Mechanisms: Dynamic Coupling. In: *Solar Variability, Weather, and Climate*. National Research Council Studies in Geophysics. National Academic Press. Washington DC pp 79–82
- Holton JR & Tan HC (1980) The influence of the equatorial quasi–biennial oscillation on the global circulation at 50 mb. *Journal of Atmospheric Sciences* 37 (10) 2200–2208
- Holton J (2003) Waves. In: Holton JR, Pyle JA & Curry JA (eds.) *Encyclopedia of Atmospheric Sciences*. Academic Press, London pp 703–711
- Holton JR & Hakim GJ (2013) *An introduction to dynamic meteorology*. 5th ed. Academic Press, Waltham MA USA
- Honda M & Nakamura H (2001) Interannual seesaw between the Aleutian and Icelandic lows. Part II: Its significance in the interannual variability over the wintertime Northern Hemisphere. *Journal of Climate* 14 (24) 4512–4529
- Hood LL (2018) Short-term solar modulation of the Madden–Julian climate oscillation. *Journal of the Atmospheric Sciences* 75 (3) 857–873
- Hoyt DV & Schatten KH (1997) *The role of the sun in climate change*. Oxford University Press. New York
- Hu FS, Kaufman D, Yoneji S et al (2003) Cyclic variation and solar forcing of Holocene climate in the Alaskan subarctic. *Science* 301 (5641) 1890–1893
- Huang J, Hitchcock P, Maycock AC et al (2021) Northern hemisphere cold air outbreaks are more likely to be severe during weak polar vortex conditions. *Communications Earth & Environment* 2 (1) 1–11
- Huang RX (2004) Ocean, energy flows in. In: Cleveland CJ (ed) *Encyclopedia of Energy*. Elsevier, Amsterdam, vol 4 pp 497-509
- Huber M & Caballero R (2011) The early Eocene equable climate problem revisited. *Climate of the Past* 7 (2) 603–633
- Huybers P & Langmuir C (2009) Feedback between deglaciation, volcanism, and atmospheric CO<sub>2</sub>. *Earth and Planetary Science Letters* 286 (3–4) 479–491
- Huybers P & Wunsch C (2005) Obliquity pacing of the late Pleistocene glacial terminations. *Nature* 434 491–494
- Intergovernmental Panel on Climate Change (2014) Summary for Policymakers. In: Core Writing Team, Pachauri RK & Meyer LA (eds) *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC, Geneva, p 4–6
- Jetsu L & Porceddu S (2015) Shifting milestones of natural sciences: The ancient Egyptian discovery of Algal's period confirmed. *PloS one* 10 (12) e0144140
- Jevrejeva S, Moore JC, Grinsted A & Woodworth PL (2008) Recent global sea level acceleration started over 200 years ago? *Geophysical Research Letters* 35 (8) L08715
- Jones PD, Jónsson T & Wheeler D (1997) Extension to the North Atlantic Oscillation using early instrumental pressure observations from Gibraltar and south-west Iceland. *International Journal of Climatology: A Journal of the Royal Meteorological Society* 17 (13) 1433–1450
- Jones PD, New M, Parker DE et al (1999) Surface air temperature and its changes over the past 150 years. *Reviews of Geophysics* 37 (2) 173–199
- Jones PD, Parker DE, Osborn TJ and Briffa KR (2016) Global and hemispheric temperature anomalies—land and marine instrumental records. In: *Trends: A Compendium of Data on Global Change*. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, US DoE doi: 10.3334/CDIAC/cli.002
- Kang SM, Seager R, Frierson DM & Liu X. (2015) Croll revisited: Why is the northern hemisphere warmer than the southern hemisphere?. *Climate Dynamics* 44 (5) 1457–1472
- Kaniewski D, Guiot J & Van Campo E (2015) Drought and societal collapse 3200 years ago in the Eastern Mediterranean: a review. *Wiley Interdisciplinary Reviews: Climate Change* 6 (4) 369-382
- Karl TR, Arguez A, Huang B et al (2015) Possible artifacts of data biases in the recent global surface warming hiatus. *Science* 348 (6242) 1469–1472

- Kerr RA (1987) Sunspot–weather correlation found. *Science* 238 (4826) 479–481
- Kerr RA (2000) A North Atlantic climate pacemaker for the centuries. *Science* 288 (5473) 1984–1985
- Kidston J, Scaife AA, Hardiman, SC et al (2015) Stratospheric influence on tropospheric jet streams, storm tracks and surface weather. *Nature Geoscience* 8 (6) 433–440
- King JW (1975) Sun-weather relationships. *Astronautics and Aeronautics* 13(4) 10–19
- Kleidon A & Lorenz R (2005) Entropy production by earth system processes. In: Kleidon A & Lorenz R (eds) *Non-equilibrium Thermodynamics and the Production of Entropy* pp 1–20. Springer, Berlin, Heidelberg.
- Klyashtorin LB (2001) Climate change and long-term fluctuations of commercial catches: the possibility of forecasting. *FAO Fisheries Technical Paper* 410. FAO, Rome
- Klyashtorin LB & Lyubushin AA (2007) *Cyclic climate changes and fish productivity*. Moscow. Vniro publishing
- Kobashi T, Severinghaus JP, Brook EJ et al (2007) Precise timing and characterization of abrupt climate change 8200 years ago from air trapped in polar ice. *Quaternary Science Reviews* 26 (9-10) 1212-1222
- Kobashi T, Box JE, Vinther BM et al (2015) Modern solar maximum forced late twentieth century Greenland cooling. *Geophysical Research Letters* 42 (14) 5992-5999
- Kodera K (1995) On the origin and nature of the interannual variability of the winter stratospheric circulation in the northern hemisphere. *Journal of Geophysical Research: Atmospheres* 100 (D7) 14077–14087
- Kodera K & Kuroda Y (2002) Dynamical response to the solar cycle. *Journal of Geophysical Research: Atmospheres* 107 (D24) ACL-5
- Kodera K, Thiéblemont R, Yukimoto S & Matthes K (2016) How can we understand the global distribution of the solar cycle signal on the Earth's surface?. *Atmospheric Chemistry and Physics* 16 (20) 12925–12944
- Kokfelt U & Muscheler R (2013) Solar forcing of climate during the last millennium recorded in lake sediments from northern Sweden. *The Holocene* 23 (3) 447-452
- Kushnir Y (1994) Interdecadal variations in North Atlantic sea surface temperature and associated atmospheric conditions. *Journal of Climate* 7 (1) 141–157
- Labitzke K (1987) Sunspots, the QBO, and the stratospheric temperature in the north polar region. *Geophysical Research Letters* 14 (5) 535–537
- Labitzke K & van Loon H (1988) Associations between the 11-year solar cycle, the QBO and the atmosphere. Part I: the troposphere and stratosphere in the northern hemisphere in winter. *Journal of Atmospheric and Terrestrial Physics* 50 (3) 197–206
- Labitzke K, Kunze M & Brönnimann S (2006) Sunspots, the QBO and the stratosphere in the North Polar Region–20 years later. *Meteorologische Zeitschrift* 15 (3) 355–363
- Lacis AA, Schmidt GA, Rind D & Ruedy RA (2010) Atmospheric CO<sub>2</sub>: Principal control knob governing Earth's temperature. *Science* 330 (6002) 356–359
- Lamb HH (1995) *Climate, history and the modern world*. 2nd edn. Routledge, London
- Lambeck K & Cazenave A (1973) The Earth's rotation and atmospheric circulation—I Seasonal variations. *Geophysical Journal International* 32 (1) 79–93
- Lambeck K & Cazenave A (1976) Long term variations in the length of day and climatic change. *Geophysical Journal International* 46 (3) 555–573
- Lambeck K & Hopgood P (1981) The Earth's rotation and atmospheric circulation, from 1963 to 1973. *Geophysical Journal International* 64 (1) 67–89
- Landsberg HE (1982) Solar variability, weather and climate. *National Weather Digest* 7 (4) 6–10
- Landscheidt T (2000) Solar forcing of El Niño and La Niña. In: Wilson A (ed) *The solar cycle and terrestrial climate. Proceedings of the 1st Solar and Space Weather Euroconference*. ESA, Noordwijk, vol 463 p 135–140
- Latif M, Sun J, Visbeck M & Hadi Bordbar M (2022) Natural variability has dominated Atlantic Meridional Overturning Circulation since 1900. *Nature Climate Change* 1-6
- Le Mouél JL, Blanter E, Shnirman M & Courtillot V (2010) Solar forcing of the semi-annual variation of length-of-day. *Geophysical Research Letters* 37 (15) L15307
- Leamon RJ, McIntosh SW & Marsh DR (2021) Termination of solar cycles and correlated tropospheric variability. *Earth and Space Science* 8 (4) e2020EA001223
- Lean JL (2017) Sun-climate connections. In: *Oxford Research Encyclopedia of Climate Science*. DOI: 10.1093/acrefore/9780190228620.013.9
- Lewandowsky S, Risbey JS & Oreskes N (2016) The “pause” in global warming: Turning a routine fluctuation into a problem for science. *Bulletin of the American Meteorological Society* 97 (5) 723-733
- Li F, Orsolini YJ, Wang H et al (2018) Modulation of the Aleutian–Icelandic low seesaw and its surface impacts by the Atlantic multidecadal oscillation. *Advances in Atmospheric Sciences* 35 (1) 95–105
- Li X, Hu ZZ & Becker E (2019) On the westward shift of tropical Pacific climate variability since 2000. *Climate Dynamics* 53 (5) 2905–2918
- Lin YF, Yu JY, Wu CR & Zheng F (2021) The Footprint of the 11-Year Solar Cycle in Northeastern Pacific SSTs and Its Influence on the Central Pacific El Niño. *Geophysical Research Letters* 48 (5) e2020GL091369
- Liu F, Li J, Wang B, et al (2018) Divergent El Niño responses to volcanic eruptions at different latitudes over the past millennium. *Climate dynamics* 50 (9) 3799–3812

- Liu Y, Lo L, Shi Z et al (2015) Obliquity pacing of the western Pacific Intertropical Convergence Zone over the past 282,000 years. *Nature communications* 6 (1) 1–7
- Lluch-Belda D, Crawford RJM, Kawasaki T et al (1989) World-wide fluctuations of sardine and anchovy stocks: the regime problem. *South African Journal of Marine Science* 8 (1) 195-205
- Lozier MS (2012) Overturning in the north atlantic. *Annual review of marine science* 4 291-315
- Lu H, Baldwin MP, Gray LJ & Jarvis MJ (2008) Decadal-scale changes in the effect of the QBO on the northern stratospheric polar vortex. *Journal of Geophysical Research: Atmospheres* 113 (D10)
- Lupo AR (2020) Atmospheric blocking events: a review. *Annals of the New York Academy of Sciences*. 1–20
- Magny M, Combourieu–Nebout N, De Beaulieu JL et al (2013) North–south palaeohydrological contrasts in the central Mediterranean during the Holocene: tentative synthesis and working hypotheses. *Climate of the Past* 9 (5) 2043–2071
- Mann M (2008) Disclosed Climategate e-mail to Phil Jones, apropos Prof. Curry comments at Stephen McIntyre blog, May 30, 2008
- Mantua NJ, Hare SR, Zhang Y et al (1997) A Pacific interdecadal climate oscillation with impacts on salmon production. *Bulletin of the American Meteorological Society* 78 (6) 1069–1080
- Mantua NJ & Hare SR (2002) The Pacific decadal oscillation. *Journal of oceanography* 58 (1) 35–44
- Marchitto TM, Muscheler R, Ortiz JD et al (2010) Dynamical response of the tropical Pacific Ocean to solar forcing during the early Holocene. *Science* 330 (6009) 1378-1381
- Marcott SA, Shakun JD, Clark PU & Mix AC (2013) A reconstruction of regional and global temperature for the past 11,300 years. *Science* 339 (6124) 1198-1201
- Marshall J & Plumb RA (2008) *Atmosphere, Ocean and Climate Dynamics: An Introductory Text*. International Geophysics Series vol 93. Academic Press
- Marshall J, Donohoe A, Ferreira D & McGee D (2014) The ocean’s role in setting the mean position of the Inter-Tropical Convergence Zone. *Climate Dynamics* 42 (7) 1967–1979
- Matthes K, Haigh J & Hanslmeier A (2016) The impact of solar variability on climate. In: Dudok de Wit T, Ermolli I, Haberreiter M et al (eds.) *Earth’s climate response to a changing Sun*. Les Ulis Cedex A, France. 13–18
- Mazzarella A (2013) Time-integrated North Atlantic Oscillation as a proxy for climatic change. *Natural Science* 5 (1A) 149–155
- McIntyre ME & Palmer TN (1984) The ‘surf zone’ in the stratosphere. *Journal of atmospheric and terrestrial physics* 46 (9) 825–849
- McKinnell SM & Crawford WR (2007) The 18.6-year lunar nodal cycle and surface temperature variability in the northeast Pacific. *Journal of Geophysical Research: Oceans* 112 (C2)
- McVicar TR & Roderick ML (2010) Winds of change. *Nature Geoscience* 3 (11) 747-748
- Medawar PB (1979) *Advice to a young scientist*. Harper & Row. New York
- Mewes D & Jacobi C (2019) Heat transport pathways into the Arctic and their connections to surface air temperatures. *Atmospheric Chemistry and Physics* 19 (6) 3927–3937
- Migowski C, Stein M, Prasad S et al (2006) Holocene climate variability and cultural evolution in the Near East from the Dead Sea sedimentary record. *Quaternary Research* 66 (3) 421-431
- Milanković M (1920) *Théorie mathématique des phénomènes thermiques produits par la radiation solaire*. Académie Yougoslave des Sciences et des Arts de Zagreb. Gauthier Villars, Paris
- Minobe S (1997) A 50–70 year climatic oscillation over the North Pacific and North America. *Geophysical Research Letters* 24 (6) 683–686
- Minobe S (1999) Resonance in bidecadal and pentadecadal climate oscillations over the North Pacific: Role in climatic regime shifts. *Geophysical Research Letters* 26 (7) 855-858
- Monier E & Weare BC (2011) Climatology and trends in the forcing of the stratospheric zonal-mean flow. *Atmospheric Chemistry and Physics* 11 (24) 12751–12771
- Monin AS (1972) *Weather Forecasting as a Problem in Physics*. MIT Press, Cambridge
- Monnin E, Steig EJ, Siegenthaler U et al (2004) EPICA Dome C ice core high resolution Holocene and transition CO2 data. IGBP PAGES/World Data Center for Paleoclimatology Data Contribution Series 55
- Moore GWK, Halfar J, Majeed H et al (2017) Amplification of the Atlantic Multidecadal Oscillation associated with the onset of the industrial-era warming. *Scientific Reports* 7 (1) 1–10
- Mouginot J, Rignot E & Björk AA (2019) Forty-six years of Greenland Ice Sheet mass balance from 1972 to 2018. *Proceedings of the national academy of sciences* 116 (19) 9239–9244
- Moy CM, Seltzer GO, Rodbell DT & Anderson DM (2002) Variability of El Niño/Southern Oscillation activity at millennial timescales during the Holocene epoch. *Nature* 420 (6912) 162–165
- Muller RA, Curry J, Groom D et al (2013) Decadal variations in the global atmospheric land temperatures. *Journal of Geophysical Research: Atmospheres* 118 (11) 5280–5286
- Nakamura N & Huang CS (2018) Atmospheric blocking as a traffic jam in the jet stream. *Science* 361 (6397) 42–47
- Nastrom GD & Belmont AD (1980). Evidence for a solar cycle signal in tropospheric winds. *Journal of Geophysical Research: Oceans* 85 (C1) 443–452

- Nathan TR, Albers JR & Cordero EC (2011) Role of wave–mean flow interaction in sun–climate connections: Historical overview and some new interpretations and results. *Journal of atmospheric and solar-terrestrial physics* 73 (11–12) 1594–1605
- Nguyen H, Evans A, Lucas C et al (2013) The Hadley circulation in reanalyses: Climatology, variability, and change. *Journal of Climate* 26 (10) 3357–3376
- Ogurtsov M, Veretenenko SV, Helama S et al (2020) Assessing the signals of the Hale solar cycle in temperature proxy records from Northern Fennoscandia. *Advances in Space Research* 66 (9) 2113–2121
- Peixoto JP & Oort AH (1992) *Physics of climate*. American Institute of Physics. New York
- Perlwitz J & Harnik N (2003) Observational evidence of a stratospheric influence on the troposphere by planetary wave reflection. *Journal of Climate* 16 (18) 3011–3026
- Pittock AB (1978) A critical look at long-term Sun-weather relationships. *Reviews of Geophysics* 16 (3) 400–420
- Polyakov IV, Alekseev GV, Timokhov LA et al (2004) Variability of the intermediate Atlantic water of the Arctic Ocean over the last 100 years. *Journal of climate* 17 (23) 4485–4497
- Porter SE, Mosley-Thompson E & Thompson LG (2019) Ice core  $\delta^{18}O$  record linked to Western Arctic sea ice variability. *Journal of Geophysical Research: Atmospheres* 124 (20) 10784–10801
- Powell Jr AM & Xu J (2011) Possible solar forcing of interannual and decadal stratospheric planetary wave variability in the Northern Hemisphere: An observational study. *Journal of Atmospheric and Solar-Terrestrial Physics* 73 (7–8) 825–838
- Proshutinsky A, Dukhovskoy D, Timmermans ML et al (2015) Arctic circulation regimes. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 373 (2052) 20140160
- Randall DA (2015) *An Introduction to the Global Circulation of the Atmosphere*. Princeton University Press
- Randel W & Park M (2019) Diagnosing observed stratospheric water vapor relationships to the cold point tropical tropopause. *Journal of Geophysical Research: Atmospheres* 124 (13) 7018–7033
- Reck RA (1976) Stratospheric ozone effects on temperature. *Science* 192 (4239) 557–559
- Reimer PJ, Bard E, Bayliss A et al (2013) IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. *Radiocarbon* 55 (4) 1869–1887
- Rigozo NR, Nordemann DJR, Echer MS et al (2007) Solar activity imprints in tree ring width from Chile (1610–1991). *Journal of atmospheric and solar-terrestrial physics* 69 (9) 1049–1056
- Rohling E, Mayewski P, Abu-Zied R et al (2002) Holocene atmosphere-ocean interactions: records from Greenland and the Aegean Sea. *Climate Dynamics* 18 (7) 587–593
- Rosen RD & Salstein DA (1985) Contribution of stratospheric winds to annual and semiannual fluctuations in atmospheric angular momentum and the length of day. *Journal of Geophysical Research: Atmospheres* 90 (D5) 8033–8041
- Rosignol-Strick M (1985) Mediterranean Quaternary sapropels: An immediate response of the African monsoon to variation of insolation. *Palaeogeography, palaeoclimatology, palaeoecology* 49 (3–4) 237–263
- Rydsaa JH, Graverson RG, Heiskanen TI & Stoll PJ (2021) Changes in atmospheric latent energy transport into the Arctic: Planetary versus synoptic scales. *Quarterly Journal of the Royal Meteorological Society* 147 2281–2292
- Salby M & Callaghan P (2000) Connection between the solar cycle and the QBO: The missing link. *Journal of Climate* 13 (2) 328–338
- Salby ML & Callaghan PF (2006) Relationship of the quasi-biennial oscillation to the stratospheric signature of the solar cycle. *Journal of Geophysical Research: Atmospheres* 111 (D6)
- Scafetta N (2010) Empirical evidence for a celestial origin of the climate oscillations and its implications. *Journal of Atmospheric and Solar-Terrestrial Physics* 72 (13) 951–970
- Schlesinger ME & Ramankutty N (1994) An oscillation in the global climate system of period 65–70 years. *Nature* 367 (6465) 723–726
- Schmitt RW (2018) The ocean’s role in climate. *Oceanography* 31 (2) 32–40
- Schwabe SH (1843) *Sonnen-beobachtungen im Jahre 1843 (Solar Observations during 1843)*. *Astronomische Nachrichten* 21 495 233
- Scotese CR (2016) Some thoughts on global climate change: The transition from icehouse to hothouse. In: Scotese CR (author) *The Earth History: The evolution of the Earth System*. PALEOMAP Project, Evanston, IL, [https://www.researchgate.net/publication/275277369\\_Some\\_Thoughts\\_on\\_Global\\_Climate\\_Change\\_The\\_Transition\\_for\\_Icehouse\\_to\\_Hothouse\\_Conditions](https://www.researchgate.net/publication/275277369_Some_Thoughts_on_Global_Climate_Change_The_Transition_for_Icehouse_to_Hothouse_Conditions) Accessed 18 Oct 2018
- Scotese CR, Song H, Mills BJ & van der Meer DG (2021) Phanerozoic paleotemperatures: The earth’s changing climate during the last 540 million years. *Earth-Science Reviews* 103503
- Scott RK & Dritschel DG (2005) Downward wave propagation on the polar vortex. *Journal of the atmospheric sciences* 62 (9) 3382–3395
- Serreze M (2010) In: *The Telegraph UK (newspaper) Arctic ice could be gone by 2030*. September, 16. <https://www.telegraph.co.uk/news/earth/earthnews/8005620/Arctic-ice-could-be-gone-by-2030.html> Accessed 12 Aug 2020
- Shaw TA, Baldwin M, Barnes EA et al (2016) Storm track processes and the opposing influences of climate change. *Nature Geoscience* 9 (9) 656–664
- Sherwood SC & Huber M (2010) An adaptability limit to climate change due to heat stress. *Proceedings of the National Academy of Sciences* 107 (21) 9552–9555

- Siscoe GL (1978) Solar–terrestrial influences on weather and climate. *Nature* 276 (5686) 348–352
- Stager JC, Ryves D, Cumming BF et al (2005) Solar variability and the levels of Lake Victoria, East Africa, during the last millennium. *Journal of Paleolimnology* 33 (2) 243–251
- Steinthorsdottir M, Vajda V, Pole M & Holdgate G (2019) Moderate levels of Eocene p CO<sub>2</sub> indicated by Southern Hemisphere fossil plant stomata. *Geology* 47 (10) 914–918
- Stenchikov G, Robock A, Ramaswamy V et al (2002) Arctic Oscillation response to the 1991 Mount Pinatubo eruption: Effects of volcanic aerosols and ozone depletion. *Journal of Geophysical Research: Atmospheres* 107 (D24) ACL-28
- Stephens GL, O'Brien D, Webster PJ et al (2015) The albedo of Earth. *Reviews of geophysics* 53 (1) 141–163
- Stuiver M (1980) Solar variability and climatic change during the current millennium. *Nature* 286 (5776) 868–871
- Stuiver M & Quay PD (1980) Changes in atmospheric carbon-14 attributed to a variable sun. *Science* 207 (4426) 11–19
- Sun W, Liu J, Wang B et al (2018) A “La Niña-like” state occurring in the second year after large tropical volcanic eruptions during the past 1500 years. *Climate Dynamics* 1–15
- Sun J & Tan B (2013) Mechanism of the wintertime Aleutian low–Icelandic low seesaw. *Geophysical Research Letters* 40 (15) 4103–4108
- Swingedouw D, Ortega P, Mignot J et al (2015) Bidecadal North Atlantic ocean circulation variability controlled by timing of volcanic eruptions. *Nature communications* 6 (1) 1–12
- Swingedouw D, Mignot J, Ortega P et al (2017) Impact of explosive volcanic eruptions on the main climate variability modes. *Global and Planetary Change* 150 24–45
- Taguchi M (2010) Observed connection of the stratospheric quasi-biennial oscillation with El Niño–Southern Oscillation in radiosonde data. *Journal of Geophysical Research: Atmospheres* 115 (D18)
- Thompson DW & Barnes EA (2014) Periodic variability in the large-scale Southern Hemisphere atmospheric circulation. *Science* 343 (6171) 641–645
- Thompson DW & Wallace JM (2000) Annular modes in the extratropical circulation. Part I: Month-to-month variability. *Journal of climate* 13 (5) 1000–1016
- Thompson LG, Mosley-Thompson E, Brecher H et al (2006) Abrupt tropical climate change: Past and present. *Proceedings of the National Academy of Sciences* 103 (28) 10536–10543
- Timmermann A, An SI, Kug JS et al (2018) El Niño–southern oscillation complexity. *Nature* 559 (7715) 535–545
- Trenberth KE & Hurrell JW (1994) Decadal atmosphere–ocean variations in the Pacific. *Climate Dynamics* 9 (6) 303–319
- Tsonis AA, Swanson K & Kravtsov S (2007) A new dynamical mechanism for major climate shifts. *Geophysical Research Letters* 34 (13)
- Tsou JY, Richardson A & Padovani F (2015) Introduction: Objectivity in Science. In: Padovani F, Richardson A & Tsou J (eds) *Objectivity in Science*. Boston Studies in the Philosophy and History of Science 310. Springer, Cham
- Usoskin IG (2017) A history of solar activity over millennia. *Living Reviews in Solar Physics* 14 (1) 3
- Usoskin IG, Solanki SK, Krivova NA et al (2021) Solar cyclic activity over the last millennium reconstructed from annual <sup>14</sup>C data. *Astronomy & Astrophysics* 649 A141
- van Wijngaarden WA & Happer W (2020) Dependence of Earth's Thermal Radiation on Five Most Abundant Greenhouse Gases. arXiv preprint arXiv:2006.03098
- Vaquero JM & Vázquez M (2009) *The Sun recorded through history*. Astrophysics and Space Science Library 361. Springer, Dordrecht
- Venne DE, Nastrom GD & Belmont AD (1983) Comment on “Evidence for a solar cycle signal in tropospheric winds” by GD Nastrom and AD Belmont. *Journal of Geophysical Research: Oceans* 88 (C15) 11025–11030
- Verdon DC & Franks SW (2006) Long-term behaviour of ENSO: Interactions with the PDO over the past 400 years inferred from paleoclimate records. *Geophysical Research Letters* 33 (6) L06712
- Veretenenko S & Ogurtsov M (2016) Cloud cover anomalies at middle latitudes: Links to troposphere dynamics and solar variability. *Journal of Atmospheric and Solar-Terrestrial Physics* 149 207–218
- Vinós J (2016) The impact of the circa 2400-year solar variability cycle on climate and human societies. <https://judithcurry.com/2016/09/20/impact-of-the-2400-yr-solar-cycle-on-climate-and-human-societies/>
- Vinós J (2019) ENSO predictions based on solar activity. <https://judithcurry.com/2019/09/01/enso-predictions-based-on-solar-activity/>
- Vinós J (2022) *Climate of the past, present and future. A scientific debate*, 2nd ed. Critical Science Press, Madrid
- von Storch H (2014) <http://klimazwiebel.blogspot.com.au/2014/05/lennart-bengtsson-leaves-advisory-board.html> Accessed March 04 2022
- Vondrák J (1977) The rotation of the Earth between 1955.5 and 1976.5. *Studia Geophysica et Geodaetica* 21 (2) 107–117
- Walsh J, Wuebbles D, Hayhoe K et al (2014) Our changing climate. In: Melillo JM, Richmond TC and Yohe GW (eds) *Climate Change Impacts in the United States: The Third National Climate Assessment*. US Global Change Research Program, p 19–67
- Wang G, Zhao C, Zhang M et al (2020) The causality from solar irradiation to ocean heat content detected via multi-scale Liang–Kleeman information flow. *Scientific Reports* 10 (1) 1–9
- Wang J, Yang B, Ljungqvist FC et al (2017) Internal and external forcing of multidecadal Atlantic climate variability over the past 1,200 years. *Nature Geoscience* 10 (7) 512–517



- Wang X & Key JR (2005) Arctic surface, cloud, and radiation properties based on the AVHRR Polar Pathfinder dataset. Part I: Spatial and temporal characteristics. *Journal of Climate* 18 (14) 2558–2574
- Wang Y, Cheng H, Edwards RL et al (2005b) The Holocene Asian monsoon: links to solar changes and North Atlantic climate Science. 308 (5723) 854–857
- Wazneh H, Gachon P, Laprise R et al (2021) Atmospheric blocking events in the North Atlantic: trends and links to climate anomalies and teleconnections. *Climate Dynamics* 56 (7) 2199–2221
- White WB, Dettinger MD & Cayan DR (2003) Sources of global warming of the upper ocean on decadal period scales. *Journal of Geophysical Research: Oceans* 108 (C8)
- White WB & Liu Z (2008) Non-linear alignment of El Niño to the 11-yr solar cycle. *Geophysical Research Letters* 35 (19) L19607
- Wigley TML & Raper SCB (1990) Climatic change due to solar irradiance changes. *Geophysical Research Letters* 17 (12) 2169–2172
- Wilcox JM, Scherrer PH, Svalgaard L et al (1973) Solar magnetic sector structure: Relation to circulation of the earth's atmosphere. *Science* 180 (4082) 185–186
- Wilcox JM, Svalgaard L & Scherrer PH (1976) On the reality of a sun-weather effect. *Journal of the Atmospheric Sciences* 33 (6) 1113–1116
- Wild M, Hakuba MZ, Folini D et al (2019) The cloud-free global energy balance and inferred cloud radiative effects: an assessment based on direct observations and climate models. *Climate Dynamics* 52 (7) 4787–4812
- Woods C, Caballero R & Svensson G (2013) Large-scale circulation associated with moisture intrusions into the Arctic during winter. *Geophysical Research Letters* 40 (17) 4717–4721
- Woods C & Caballero R (2016) The role of moist intrusions in winter Arctic warming and sea ice decline. *Journal of Climate* 29 (12) 4473–4485
- Worthington EL, Moat BI, Smeed DA et al (2021) A 30-year reconstruction of the Atlantic meridional overturning circulation shows no decline. *Ocean Science* 17 (1) 285–299
- Wu CJ, Usoskin IG, Krivova N et al (2018) Solar activity over nine millennia: A consistent multi-proxy reconstruction. *Astronomy & Astrophysics* 615 A93
- Wyatt MG (2012) A multidecadal climate signal propagating across the Northern Hemisphere through indices of a synchronized network. Dissertation, University of Colorado at Boulder
- Wyatt MG & Curry JA (2014) Role for Eurasian Arctic shelf sea ice in a secularly varying hemispheric climate signal during the 20th century. *Climate dynamics* 42 (9–10) 2763–2782
- Yang H, Li Q, Wang K et al (2015) Decomposing the meridional heat transport in the climate system. *Climate Dynamics* 44 (9–10) 2751–2768
- Yu L & Weller RA (2007) Objectively analyzed air–sea heat fluxes for the global ice-free oceans (1981–2005). *Bulletin of the American Meteorological Society* 88 (4) 527–540
- Zeng Z, Ziegler AD, Searchinger T et al (2019) A reversal in global terrestrial stilling and its implications for wind energy production. *Nature Climate Change* 9 (12) 979–985
- Zhang DD, Lee HF, Wang C et al (2011) Climate change and large-scale human population collapses in the pre-industrial era. *Global Ecology and Biogeography* 20 (4) 520–531
- Zhang Y, Xu J, Yang N & Lan P (2018) Variability and Trends in Global Precipitable Water Vapor Retrieved from COSMIC Radio Occultation and Radiosonde Observations. *Atmosphere* 9 (5) 174
- Zielinski GA, Mayewski PA, Meeker LD et al (1996) A 110,000-yr record of explosive volcanism from the GISP2 (Greenland) ice core. *Quaternary Research* 45 (2) 109–118