

AOS 801 FALL 2015: RADIATION AND ENERGY IN THE CLIMATE SYSTEM

TOPIC AND READING SCHEDULE

Date	Topics	References*
Sep. 3	Course Overview, Review of Radiometric Concepts – Planck, Boltzmann, Wein, Flux vs. Radiance	Lecture Notes
Sep. 8	Review of Radiative Transfer – Radiative Transfer Equation, Two-Stream Models, Radiative Heating	Lecture Notes
Sep. 15	Earth's Energy Budget – Top of Atmosphere Balance, Greenhouse Effect, Surface Fluxes, Imbalances	Dines (1917), Vonder Haar and Suomi (1971), Hansen et al. (2005), Trenberth et al. (2014)
Sep. 17	Earth's Energy Budget – Modern Controversy, Zonal Imbalances, Meridional Heat Transport	Trenberth et al. (2009), Stephens et al. (2012), Trenberth and Caron (2001)
Sep. 22	Radiative Forcing of Climate	Lecture Notes, Hansen et al. (1997)
Sep. 24	Greenhouse Gas and Cloud Forcing of Climate	Stephens and Greenwald (1991a), Harrison et al. (1990), Ockert-Bell and Hartmann (1992), Hartmann et al. (1992), Gleckler et al. (1995)
Oct. 6	Aerosol Forcing of Climate – Direct Effects, Indirect Effects, Semi-direct Effects	Yu et al. (2006), Wild et al. (2005), Matus et al. (2015), Twomey (1977), Albrecht (1989), Stevens and Feingold (2009)
Oct. 8	Radiative-Convective Equilibrium – Convection, Simple Models	Manabe and Moller (1961), Manabe and Strickler (1964), Manabe and Wetherald (1967)
Oct. 15	Radiative-Convective Equilibrium – Clouds, Complex Models	Stephens and Webster (1981), Emanuel et al. (2013), van den Heever et al. (2011)
Oct. 27	Energy Balance Models – Simple EBMs, Ice-albedo Feedback, The Faint Young Sun and Ice Catastrophe	Lecture Notes, Budyko (1969), Sellers (1969),
Oct. 29	Energy Balance Models – Weather and Climate, Time-dependent EBMs, Stochastically-forced EMBs	Lorenz (1979), Hasselman (1976), Robock (1978)
Nov. 3	Feedbacks in the Climate System – General Theory, Stefan-Boltzmann Feedback, Greenhouse Gas Feedbacks, Biosphere Feedbacks (Daisyworld)	Lecture Notes, Rasool and de Bergh (1970), Held and Soden (2000), Watson and Lovelock (1983), Wood et al. (2008)
Nov. 5	Cloud Feedbacks – High-cloud Feedback, Low Cloud Feedback	Lecture Notes, Ramanathan and Collins (1991), Clement et al. (2009), Dessler (2010)
Nov. 10	The Global Water Cycle and guest lecture on TRMM/GPM research	Trenberth et al. (2008), Wentz et al. (2007), Stephens and Ellis (2008)
Nov. 12	Cloud Feedbacks II – The Iris Hypothesis	Lindzen et al. (2001), Hartmann and Michelsen (2002), Lin et al. (2002)
Nov. 24	Climate Sensitivity – Introduction to Climate Sensitivity, Methods for Computing Climate Sensitivity	Lecture Notes, Gregory et al. (2004), Hansen et al. (2005), Forster and Gregory (2006)
Dec. 1	Climate Sensitivity – Response Timescales, Separating Forcing, Responses, and Feedbacks	Andrews et al. (2012), Andrews et al. (2015), Chung and Soden (2015)
Dec. 3	Climate Sensitivity – Radiative Kernels	Soden et al. (2008), Zelinka et al. (2012)
Dec. 15-17	Final Presentations	Students

* All course references can be found on the course website: <http://aos.wisc.edu/~tristan/aos801>

PAPER PRESENTATION SIGN-UP

Sign up for one review in each section. Please sign up for two single-paper and one multi-paper review.

Topic	Paper(s)	Presenter	Date
ERB	Hansen et al. (2005) & Trenberth et al. (2014)	Elin	Sep. 15
ERB	Trenberth et al. (2009) & Stephens et al. (2012)	Alyson	Sep. 17
Transports	Trenberth and Caron (2001)	Ethan	Sep. 17
Radiative Forcing	Hansen et al. (1997)	Marian	Sep. 22
Radiative Forcing	Stephens and Greenwald (1991)	Kate	Sep. 24
Radiative Forcing	Harrison et al. (1990) & Gleckler et al. (1995)	Kyle	Sep. 24
RCE	Stephens and Webster (1981)	Kai-Wei	Oct. 15
RCE	Emanuel et al. (2006)	Kaba	Oct. 15
RCE	van den Heever et al. (2011)	Elin	Oct. 15
Stochastic EBM	Hasselmann (1976)	April	Oct. 29
Stochastic EBM	Robock (1978)	Kyle	Oct. 29
Stochastic EBM	Lorenz (1979)	Kai-Wei	Oct. 29
Water Vapor Feedback	Rasool and de Bergh (1970) and Held and Soden (2000)	Kate	Nov. 3
Biological Feedbacks	Watson and Lovelock (1983) & Wood et al. (2008)	Ethan	Nov. 3
Cloud Feedbacks	Ramanathan and Collins (1991), Clement et al. (2009), and Dessler (2010)	Kaba	Nov. 5
Water Cycle*	Trenberth et al. (2008)	April	Nov. 10
Water Cycle*	Wentz et al. (2007) & Stephens and Ellis (2008)	Alyson	Nov. 10
Iris Hypothesis	Lindzen et al. (2001), Hartmann and Michelsen (2002), and Lin et al. (2002)	Elin/Marian	Nov. 12
Climate Sensitivity	Gregory et al. (2004)	Ethan	Nov. 24
Climate Sensitivity	Hansen et al. (2005)	Marian	Nov. 24
Climate Sensitivity	Forster and Gregory (2006)	Kaba	Nov. 24
Responses	Andrews et al. (2012) & Andrews et al. (2015)	Alyson/Kyle	Dec.. 1
Responses	Chung and Soden (2015)	Kai-Wei	Dec. 1
Radiative Kernels	Soden et al. (2008)	Kate	Dec. 3
Radiative Kernels	Zelinka et al. (2012)	April	Dec. 3
Entropy and Climate	Stephens and O'Brien (1993)	N/A	N/A
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* In coordination with Dave Henderson visiting from Colorado State University.