

Atmospheric Circulation in a Changing Climate

A Joint DynVarMIP · SPARC DynVar · SNAP Meeting
Hosted by the Facultad de Ciencias Fisicas - Universidad Complutense de Madrid

22-25 October 2019 · Madrid

Workshop Program

We thank our organizational sponsors for making this workshop possible.



Tuesday, 22 October 2019

8.15-9.00 Registration

9.00-9.30 Welcome

Climate change in the middle atmosphere, Chair: **Marta Abalos**

9.30-10.15: **Rolando Garcia (keynote)** On the response of the middle atmosphere to anthropogenic forcing

10.15-10.30: **Qiang Fu** The Brewer-Dobson Circulation during the Last Glacial Maximum

10.30- 10.45: **Hella Garny** Reconciling modelled and observed stratospheric Age of Air Trends

10.45-11.00: **Natalia Calvo** On the timescales of the Brewer-Dobson circulation response to a quadruple CO₂ increase in WACCM

11.00-11.30: coffee break and poster session 1

Climate change and model biases, Chair: **Hauke Schmidt**

11.30-12.00: **Elisabeth Blanc (invited)** Towards improving climate models in the framework of the ARISE H2020 project.

12.00-12.15: **Kevin Grise** Recent Tropical Expansion: What We've Learned from CMIP5 and Early Results from CMIP6

12.15-12.30: **Molly Menzel** Disconnect between Hadley Cell and subtropical jet variability and response to increased CO₂

12.30-12.45: **Alison Ming** Seasonal and interannual variations in the tropical tropopause layer

12.45-13.00: **Penelope Maher** Is the subtropical jet shifting poleward?

13.00-14.30: Lunch break

Climate change and model biases, Chair: **Kevin DallaSanta**

14.30-15.00: **Michael Sigmund (invited)** The role of the basic state in the circulation response to climate change

15.00-15.15: **Nedjeljka Zagar** Estimating scale-dependent variability and bias in climate models

15.15-15.30: **Chaim Garfinkel** Identifying the cause(s) of biases in the Southern Hemisphere jet in comprehensive models

15.30-15.45: **Clara Orbe** Dynamical Sensitivity to Abrupt Changes in CO₂ as Represented in two versions of the NASA GISS ModelE E2.1 and E2.2

15.45-16.00: **Amanda Maycock** Rapid adjustments and the response of North Atlantic winter circulation to forcing

16.00-16.30: coffee break and poster session 1

16:30-17:00: *Flash talks for Poster session 1*

17.00-18.00: Poster session 1

18.00-... Ice breaker and poster session 1

Wednesday, 23 October 2019

The austral circulation, Chair: **Julia Mindlin**

9.00-9.30: **Paulo Ceppi (invited)** The role of the stratospheric polar vortex for the austral jet response to greenhouse gas forcing

9.30-9.45: **Tom Wood** Does the high climate sensitivity in some CMIP6 models affect future SAM trends?

9.45-10.00: **Ioana Ivanciu** Relative contributions from CO₂ and ozone on southern hemisphere westerly winds and their consequences for ocean circulation

10.00-10.15: **Elio Campitelli** Variability and trends of circulation zonal asymmetries in the Southern Hemisphere

10.15-10.30: *Special late breaking addition* **Eun-Pa Lim** The (minor) warming of the austral polar vortex in 2019

10.30-11.00: *flash talks for Poster session 2.*

11.00-11.30: coffee break and poster session 2

Variability and change, Chair: **Javier Garcia-Serrano**

11.30-11.45: **Thomas Birner** Eddy-Hadley Cell Interactions

11.45-12.00: **Gabriel Chiodo** On the role of stratospheric composition feedbacks for the climate response to anthropogenic greenhouse gases

12.00-12.15: **Pu Lin** Understanding the climate response to ozone depletion: interactive ozone versus prescribed ozone

12.15-12.30: **Jessica Neu**: Disentangling QBO and ENSO Impacts on Stratospheric Circulation and Tracer Transport

12.30-12.45: **Bo Christiansen** Forcing of the QBO under different ENSO phases

12.45-13.00: **Scott Osprey**: A summary of Phase 1 of the Quasi-biennial Oscillation Initiative (QBOi)

13.00-14.30: Lunch break

Variability and change, Chair: **Masakazu Taguchi**

14.30-15.00: **Blanca Ayarzagüena (invited)** Sudden stratospheric warming events in a changing climate

15.00-15.15: **Rachel White** Atmospheric waveguides in re-analysis data and CMIP6 simulations

15.15-15.30: **Philip Rupp** Baroclinic wave dynamics in the tropopause communication layer

15.30-15.45: **Hilla Gerstman**: The asymmetric response of the Atlantic and Pacific storm track to stratospheric forcing in current and future climates

15.45-16.00: **Dor Sandler** Understanding Future Climate Trends of Northern Hemisphere Meridional Winds Through the Lens of Subseasonal Teleconnections

16.00-16.30: coffee break and poster session 2

16.30-18.30: Poster session 2

Thursday, 24 October 2019

Theory of stratosphere - troposphere coupling, Chair: **Yulia Zyulyaeva**

9.00-9.30: **Peter Hitchcock (invited)** Robust and non-robust aspects of extratropical stratosphere-troposphere coupling

9.30-9.45: **Alvaro de la Camara**: Anomalous tropospheric wave activity and sudden stratospheric warmings

9.45-10.00: **Lesley Gray**: What influences the timing of a Sudden Stratospheric Warming?

10.00-10.15: **Mark Baldwin**: Tropospheric amplification of stratospheric variability

10.15-10.30: **Kevin DallaSanta** Predictability of the zonal-mean tropical circulation on S2S timescales

10.30-11.00: coffee break

Teleconnections and tropical-extratropical interactions, Chair: **Cory Barton**

11.00-11.30: **Sarah Kang (invited)** Distinct Walker circulation response to extratropical radiative cooling in each hemisphere

11.30-11.45: **Paloma Trascasa - Castro**: On the linearity of the stratospheric and Euro-Atlantic sector response to ENSO

11.45-12.00: **Israel Weinberger**: The salience of nonlinearities in the boreal winter response to ENSO: Arctic stratosphere and Europe

12.00-12.15: **Bernat Jimenez**: ENSO influence on the North Atlantic: Nonlinearity and interaction between the stratospheric and the tropospheric pathways

12.15-12.30: **Marlene Kretschmer**: Using causal discovery algorithms to evaluate Arctic-Stratosphere linkages in CMIP5 models

12.30-13.30: Lunch break

Teleconnections and stratosphere – troposphere coupling, Chair: **Toshihiko Hirooka**

13.30-13.45: **Ian White**: An examination of the downward influence of SSWs using an imposed high-latitude warming

13.45-14.00: **Emilien Jolly** A dynamical mechanism linking Arctic Amplification and midlatitude Cold Spells using idealized numerical modelling

14.00-14.15: **Nicholas Tyrrell**: Siberian snow forcing in a dynamically bias-corrected model

14.15-14.30: **Froila Palmeiro** Climatological heat flux in the lower stratosphere and sudden stratospheric warmings: seasonality and modulations

14.30-14.45: **Paolo Ruggieri**: Seasonal forecast in the winter stratosphere

14.45-15.00: **Vasilisa Vorobyeva**: Investigation of the Structure and Predictability of the First Mode of Stratospheric Variability Based on the INM RAS Climate Model

15.00-15.30: *flash talks for Poster session 3.*

17.30-19.30: social activity

20.00-...: workshop dinner at Circulo de Bellas Artes de Madrid

Friday, 25 October 2019

S2S predictability of stratosphere – troposphere coupling, Chair: **Shingo Watanabe**

9.00-9.30: **Andrea Lang (invited)** Troposphere-Stratosphere Coupling and Synoptic Variability in Early Season Weak Vortex Events

9.30-9.45: **Amy Butler**: Predictability of Northern Hemisphere final stratospheric warmings and their surface impacts

9.45-10.00: **Daniela Domeisen** The role of the stratosphere in subseasonal to seasonal prediction

10.00-10.15: **Hera Kim**: Extratropical Prediction Skill of the Subseasonal-to-Seasonal (S2S) Prediction Models

10.15-10.30: **Jian Rao**: The 2019 New Year Stratospheric Sudden Warming and Its predictions in 11 S2S models

10:30-10:45: **Jung Choi**: Surface prediction skill of the ECMWF model depends on stratospheric initial conditions

10.45-11.00: coffee break and Poster session 3.

11.00-13.00: Poster session 3.

13.00-14.30: Lunch break with coffee.

S2S predictability of stratosphere – troposphere coupling, Chair: **Yuli Zhang**

14.30-15:00: **Martin Jucker (invited)** Stratosphere-troposphere coupling in the Southern Hemisphere beyond the polar vortex breakdown

15.00-15.15: **Elena Saggioro**: Quantifying the time scale and strength of Southern Hemisphere intra-seasonal stratosphere-troposphere coupling

15.15-15.30: **Aditi Sheshadri**: Representing stratosphere-troposphere interactions using Principal Oscillation Patterns

15.30-15.45: **Yueyue Yu**: Feeling the pulse of the stratospheric mass circulation: an emerging opportunity for sub-seasonal prediction of cold-air outbreaks

15.45-16.00: **Craig Long**: Evaluation of Stratospheric Based Tools to Aid Sub-Seasonal Forecasts at NOAA/Climate Prediction Center

16.00-16.30: Final remarks

Poster Session 1: Climate Model Prediction and Biases

- 01. Marta Abalos** The Brewer-Dobson circulation in CMIP6 models
- 02. Juan-Antonio Anel** Extratropical age of air trends and causative factors in climate projection simulations
- 03. Antara Banerjee** A pause in Southern Hemisphere circulation trends due to the Montreal Protocol
- 04. Andreas Chrysanthou** Decomposing the Brewer-Dobson Circulation response to an abrupt 4xCO₂ perturbation
- 05. Jezabel Curbelo** Spatial Distribution of Eddy Mixing in the Northern Winter Stratosphere/Upper Troposphere
- 06. Roland Eichinger** Effects of missing gravity waves on stratospheric mean dynamics and future changes
- 07. Edwin Gerber** The Response of the Jet Streams to Global Warming Across a Hierarchy of Models
- 08. Lesley Gray** The SPARC Reanalysis Inter-comparison Project (S-RIP)
- 09. Alexey Karpechko** Projected stratospheric polar vortex change and its association with surface climate
- 10. Elisa Manzini** Stratosphere-Troposphere Circulation Changes
- 11. Julia Mindlin** Storyline Approach for the Evaluation of South American Regional Climate Change
- 12. Petr Sacha** How do gravity wave parameterizations influence atmospheric transport in current generation global climate models?
- 13. Hauke Schmidt** Polar vortex response to external forcings in a 100-member ensemble of historical simulations
- 14. Kasturi Shah** Measuring and explaining changes in stratospheric tropical width
- 15. Pavel Vargin** Investigation of boreal storm tracks in historical simulations of INM CM5 and reanalysis data

Poster Session 2: Teleconnections and Stratosphere-Troposphere Coupling

- 01. Alexandre Audette** New coordinated simulations to help explain Arctic-midlatitude linkages mediated by moist isentropic overturning atmospheric circulation responses
- 02. Javier Garcia-Serrano** Prediction of the quasi-biennial oscillation with a multi-model ensemble of QBO-resolving models
- 03. Naoe Hiroaki** Holton-Tan mechanism in the effect of the QBO on the polar vortex in MRI-ESM 2.0 QBOi experiments
- 04. Maria Kolennikova** Arctic winter stratosphere response on ENSO in model simulations and reanalysis data
- 05. Eun-Pa Lim** A weakened relationship of the Southern Annular Mode with extreme El Niño with a continuation of the tropical ocean warming
- 06. Aaron Match** The Buffer Zone of the Quasi-Biennial Oscillation: Formation and Variability
- 07. Bianca Mezzina** Multi-model assessment of the late-winter ENSO teleconnection in the Euro-Atlantic sector
- 08. Cristina Pena** Tropical deep convection impact on southern winter stationary waves and its modulation by the Quasi-Biennial Oscillation
- 09. Federico Serva** Climate model simulation of stratosphere-troposphere interactions in the tropics
- 10. Masakazu Taguchi** A Study of Predictability of Major Stratospheric Sudden Warmings Using the S2S Prediction Project Database
- 11. Roland Walz** Polar vortex regimes in a simple general circulation model
- 12. Zheng Wu** What sets the model-simulated SSW frequency?
- 13. Yulia Zyulyaeva** Polar Vortex: long-term variability of main characteristics, and links to the dynamics of the troposphere

Poster Session 3: S2S Predictability and Extreme Events

- 01. Cory Barton** Impact of Model Vertical Resolution and Downward Mesospheric Influence on Predictability of Stratosphere-Troposphere Interactions over S2S Time Scales
- 02. Ghyslaine Boschat** Importance of zonal versus meridional atmospheric flow for climate extremes in the Southern Hemisphere
- 03. Andrew Charlton-Perez** A signal and noise analysis of stratosphere-troposphere coupling in the S2S models
- 04. Kai Kornhuber** Recurrent Rossby waves in observations and models
- 05. Toshihiko Hirooka** Downward Propagation of Planetary Wave Packets to the Troposphere during the Northern Hemisphere winter
- 06. Simon Lee** Abrupt stratospheric vortex weakening associated with North Atlantic anticyclonic wave breaking
- 07. Eun-Pa Lim** Impact of Ozone on Predicting Downward Coupling from the Southern Hemisphere Polar Stratospheric Vortex: A Case Study for the 2002 Stratospheric Warming
- 08. Craig Long** Understanding the role of the extratropical stratospheric circulation in subseasonal prediction of temperature within a multiple linear regression framework
- 09. Irina Rudeva** Role of stationary waves in midlatitude extreme events
- 10. Irina Statnaia** Mechanisms and predictability of Sudden Stratospheric Warming in winter 2018
- 11. Lars VanGalen** Deep Stratospheric Warmings: classifying SSWs based on vertical extent results in stronger tropospheric response
- 12. Shingo Watanabe** Hindcasts of the 2016 Disruption of the Stratospheric Quasi-biennial Oscillation
- 13. Yuli Zhang** A Major Stratospheric Sudden Warming Event and Its Association with Surface Weather