The Role of Atmospheric Dynamics for Climate and Extremes

A Joint DynVar - SNAP Meeting

Organized by the Meteorological Institute at Ludwig-Maximilians-University Munich
9-13 October 2023 - Munich

Workshop Program

We thank our organizational sponsors for making this workshop possible.
Monday, 9 October 2023
8.00-8.45 Registration
8.45-9.00 Welcome

**Session 1: Arctic and mid-latitude linkages**, Chair: Gabriel Chiodo
9.00-9.45: **Paul Kushner (keynote)**, Perspectives on SPARC DynVar
9.45-10.00: **Michael Sigmond**, Key role of the basic state in the atmospheric circulation response to future sea ice loss
10.00-10.15: **Dörthe Handorf**, The role of the Scandinavian blocking for pathways of Arctic-midlatitude linkages
10.15-10.30: **Joonsuk Kang**, Arctic Sea Ice Loss Weakens Northern Hemisphere Summertime Storminess but Not Until the Late 21st Century

10:30-10.55: coffee break

**Session 1: Arctic and mid-latitude linkages (cont’d)**, Chair: Gabriel Chiodo
10.55-11.10: **Xiaocen Shen**, Quantifying the causal effect of Barents-Kara Sea sea ice loss on stratospheric polar vortex variability in large ensembles
11.10-11.25: **Regan Mudhar**, Understanding the Stratospheric Response to Arctic Amplification

**Session 2: Circulation and climate change**, Chair: Clara Orbe
11.25-11.45: **Tim Woollings (invited)**, Revisiting observed jet stream trends and the link to tropical warming
11.45-12.00: **Orli Lachmy**, The midlatitude circulation response to climate change and the role of midlatitude diabatic heating
12.00-12.15: **Or Hadas**, The Lagrangian response of storms to changes in atmospheric forcing
12.15-12.30: **Gang Chen**, Response of Northern Hemisphere Winter Circulation Waviness to Climate Change in Large Ensemble Simulations

12.30-14.00: Lunch break (DynVar lunch)

**Breakout 1**
14.00-14.15: **Doug Smith** (virtual), Attribution of multi-annual to decadal changes in the climate system: The Large Ensemble Single Forcing Model Intercomparison Project (LESFMIP)
14.15-15.00: Breakout group on “A new SPARC limited-term cross-activity focused project (LTCF) on analysis of LESFMIP”
15.00-15.25: coffee break

**Session 2: Circulation and climate change (cont’d)**, Chair: Zachary Lawrence
15.25-15.40: **Tiffany Shaw**, Fast jet stream winds get faster under climate change
15.40-15.55: **Molly Menzel** (presented by **Darryn Waugh**), Connections between Upper Tropospheric and Lower Stratospheric Circulation Responses to Increased CO2
15.55-16.10: **Rei Chemke**, Human-induced weakening of the Northern Hemisphere tropical circulation
16.10-16.25: Simchan Yook, The role of moist lapse rate on the temperature variability in the tropical atmosphere
16.40-16.55: Benny Keller, Unraveling the large scale forcing of projected drying in the Mediterranean region
16.55-17.10: Marlene Kretschmer, Subseasonal and Seasonal drivers of European winter Weather
17.10-17.25: Kevin Grise, Atmospheric circulation constraints on 21st century seasonal precipitation storylines for the southwestern United States

17.25-...: Poster session A and Ice Breaker

Tuesday, 10 October 2023

8.45-9.00 Announcements
Session 3: Climate models and biases, Chair: Ewa Bednarz
9.00-9.20: Christiane Jablonowski (invited), Tropical Stratosphere-Troposphere Interactions in Selected CMIP6 Models
9.20-9.35: Ghyslaine Boschat, Evaluation of the seasonal evolution of the Antarctic stratospheric vortex in CMIP6 models
9.35-9.50: Petr Šácha, Unraveling climate impacts of atmospheric internal gravity waves
9.50-10.05: Felix Plöger, Stratospheric water vapor affecting atmospheric circulation

10.05-10.30: coffee break

Session 3: Climate models and biases (cont’d), Chair: Ewa Bednarz
10.30-10.45: Yuan-Bing Zhao, Atmospheric bias responses to regional systematic SST errors: background-SST dependence and geographical dependence
10.45-11.00: Xinshuiyu Liu, Implications of warm pool bias in CMIP6 models on the Northern Hemisphere wintertime subtropical jet and precipitation
11.00-11.15: Albert Ossó, Models underestimate the North Atlantic jet persistence
11.15-11.30: Simon Lee, Why is the Pacific center-of-action of the Northern Annular Mode larger in models than observations?

11.30-13.00: Lunch break (LESFMIP single forcing lunch meeting)

Session 4: Extratropical Dynamics, Chair: Rei Chemke
13.00-13.15: Hisashi Nakamura, Cyclonic and anticyclonic contributions to the midwinter minimum of the North Pacific storm-track activity
13.15-13.30: Alice Portal, Atmospheric circulation anomalies resulting from cold East-Asian orography in climate models
13.30-13.45: Gabriele Messeri, Stratospheric wave reflection modulates North American wintertime temperatures
Panel Presentations
13.45-13.50: Brief overview of SPARC Activity Collaborations - Seok-Woo Son
13.50-14.05: Jonathon Wright, Expanding Stratosphere Troposphere Coupling Evaluations in the SPARC-Reanalysis Intercomparison Project Phase 2 (S-RIP2): Planned S-RIP Phase 1 Updates
14.05-14.45: Panel Discussion on “Interaction of DynVar and SNAP with other SPARC/WMO activities”. Short presentations by: WWRP SAGE - Steve Woolnough; WCRP WGSIP - Yuhei Takaya; HTHH activity - Paul Newman; CCMi activity - Gabriel Chiodo; QBOi activity - Neil Butchart; Gravity Waves - Laura Holt
14.45-16.05: Poster session A and coffee break

Session 4: Extratropical Dynamics (cont’d), Chair: Zachary Lawrence
16.05-16.20: Pedram Hassanzadeh, The Intrinsic 150-Day Periodicity of the Southern Hemisphere Extratropical Large-Scale Atmospheric Circulation
16.20-16.35: Morio Nakayama, Impacts of a Midlatitude Oceanic Frontal Zone on the Southern Baroclinic Annular Mode
16.35-16.50: Ian White, On the Role of Midlatitude Diabatic Heating in the Extratropical Circulation

Session 5: Tropical processes, Chair: Mohamadou Diallo
16.50-17.10: Dillon Elsbury (invited), Zonal asymmetries in the QBO’s wintertime extratropical teleconnections and their representation in climate models
17.10-17.25: Mario Rodrigo, Is there an impact of the QBO on ENSO? A first approach from EC-EARTH
17.25-17.40: Kohei Yoshida, Large ensembles unveil quantitative impact of El Niño-Southern Oscillation and Quasi-Biennial Oscillation on Northern Hemisphere stratosphere-troposphere coupling
17.40-17.55: Aleena Moolakkunnel Jaison, On alleviating semi-annual oscillation wind biases in climate models

19.30: Conference Dinner at the Augustiner-Keller Restaurant, downtown Munich

Wednesday, 11 October 2023

8.45-9.00 Announcements
Session 6: Stratospheric circulation changes and interactions with chemistry, Chair: Felix Ploeger
9.00-9.20: Marta Abalos (invited), Trends in the Brewer-Dobson circulation: an overview
9.20-9.35: Mohamadou Diallo, New insights of the Brewer-Dobson circulation changes from the ERA5 reanalysis and CCMi2
9.35-9.50: Samuel Benito-Barca, Role of polar vortex and Brewer-Dobson Circulation projections uncertainties on the spread of ozone recovery
9.50-10.10: Marina Friedel (invited), Springtime surface anomalies forced by Arctic ozone
10.10-10.25: Eun-Pa Lim (virtual), The impact of ozone forcing on the 2020 super vortex
over Antarctica and associated positive SAM

10.25-10.40: Gabriel Chiodo, The influence of springtime Arctic ozone recovery on stratospheric and surface climate

10.40-11.50: Poster session B and coffee break

Session 6: Stratospheric circulation changes and interactions with chemistry (cont’d), Chair: Felix Ploeger
11.50-12.05: Ewa Bednarsz, Impact of the latitude of stratospheric aerosol injection on the stratosphere-troposphere coupling
12.05-12.20: Frederik Harzer: On the pattern of interannual polar vortex-ozone co-variability during northern hemispheric winter

Session 7: North Atlantic Decadal Variability, Chair: Ian White
12.20-12.40: Noel Keenlyside (invited; presented by Nour-Eddine Omrani), Internal climate dynamics as a key source of recent Atlantic climate decadal variability
12.40-12.55: Clara Orbe, Coupled Stratospheric Ozone and Atlantic Meridional Overturning Circulation Feedbacks on the Northern Hemisphere Midlatitude Jet Response to 4xCO2

13.10-...: Lunch to-go and Optional Social Activity

Thursday, 12 October 2023

8.45-9.00 Announcements
Session 8: Stratosphere-troposphere coupling and biases in S2S models, Chair: Xiuyuan Ding
9.00-9.20: Peter Hitchcock (invited), Mechanisms of stratospheric influence on surface weather: insights from SNAPSI Working Group 3
9.20-9.35: Seok-Woo Son, Downward coupling mechanism of Sudden Stratospheric Warming: A Mass Flux Perspective
9.35-9.50: Jonas Spaeth, Tropospheric planetary waves before, during and after sudden stratospheric warmings as represented in extended-range ensemble forecasts
9.50-10.10: Zachary Lawrence (invited), Stratosphere and stratosphere-troposphere coupling biases in subseasonal-to-seasonal forecast models: An international SNAP community effort
10.10-10.15: Waves to Weather Presentation
10.15-10.40: coffee break

Session 9: S2S predictability of extremes, Chair: Hilla Afargan-Gerstman
10.40-11.00: William Seviour (invited), Attributing the role of sudden stratospheric warming events in surface weather extremes
11.00-11.15: Jinlong Huang (virtual), Stratospheric Influence on the Development of the 2018 Late Winter European Cold Air Outbreak
11.15-11.30: Irina Statnaia, Factors influencing subseasonal predictability of Northern Eurasian cold spells

**Breakout 2**
11.30-12.30: Breakout group discussion on “Bridging prediction and projections: Future collaborations and directions of DynVar and SNAP”

12.30-14.00: Lunch break (SNAPSI working group lunch)

**Session 9: S2S predictability of extremes (cont’d),** Chair: Hilla Afargan-Gerstman
14.00-14.15: Xiuyuan Ding, Stratospheric Wave Precursor of Cold Events over North America
14.15-14.30: Christopher Polster, A new atmospheric background state to diagnose local wave guidability
14.30-14.45: Andrea Lopez Lang, A multiscale perspective of the dynamics of North American winter extremes
14.45-15.00: Vikki Thompson, Large Scale Dynamics of the Western European flooding of July 2021
15.00-15.15: Justin Finkel, Revealing the Statistics of Extreme Events Hidden in Short Weather Forecast Data

15.15-16.55: **Poster session B and coffee break**

**Session 10: Stratosphere-troposphere coupling and surface predictability,** Chair: Irina Statnaia
16.55-17.15: Hera Kim (invited), Quantification of the stratospheric contribution to surface predictability
17.15-17.30: Robert Lee, Fitting a minimal model to investigate S2S hindcast predictability associated with stratosphere-troposphere coupling
17.30-17.45: Verónica Martínez-Andradas, Precursors of the North Atlantic jet response to sudden stratospheric warmings
17.45-18.00: Hilla Afargan-Gerstman, The role of the stratosphere in predictability of the storm track in the North Atlantic and Europe

**Friday, 13 October 2023**

8.45-9.00 Announcements

**Session 11: Upward wave coupling and predictability of stratospheric events,** Chair: Dillon Elsbury
9.00-9.20: Blanca Ayarzagüena (invited), Quantifying the role of the stratosphere in upward wave propagation during stratospheric polar vortex disturbances: A SNAPSI analysis
9.20-9.35: Chris Kent, An Atlantic tipping point for a sudden stratospheric warming
9.35-9.50: Rachel Wu, Bimodality in the Predictability of Sudden Stratospheric Warming Events: A Case Study of the 2009 and 2018 Events
9.50-10.05: Hyeong-Oh Cho, The predictability of 2021 SSW event controlled by the zonal-mean state in S2S prediction models

10.05-10.20: Wolfgang Wicker (virtual), Extended stratospheric predictability during sudden stratospheric warmings due to resolved and parameterized gravity wave processes

10.20-10.45: coffee break

Session 11: Upward wave coupling and predictability of stratospheric events (cont’d), Chair: Dillon Elsbury
10.45-11.00: Zheng Wu, Seasonal Prediction of Stratospheric Polar Vortex Strength Using an Explainable Artificial Intelligence Framework
11.00-11.20: Hamid Pahlavan (invited), Evolution and Wave Forcing of the QBO in the Subseasonal Forecast Models

Session 12: Weather regimes, Chair: Philip Rupp
11.20-11.35: Sohan Suresan (presented by Nili Harnik), Computing and analyzing persistent merged jet state in climate model using rare event algorithm
11.35-11.50: Nili Harnik, The relationship between cyclones, anticyclones, and Rossby Wave Breakings in different Atlantic weather regimes
11.50-12.05: Seraphine Hauser, Tropospheric pathways to Greenland Blocking in ERA5 from a weather regime perspective and the role of moist processes
12.05-12.20: Hera Guðlaugsdóttir (virtual), The climate response after high latitude volcanic eruptions: Implications for NA weather regimes and extreme events

12.20-13.50: Lunch break (SNAP lunch. Discussion on future projects in SNAP, with presentations by WCRP ESMO- Bill Merryfield; WWRP SAGE- Steve Woolnough).

Breakout Wrap-ups, Chair: Tiffany Shaw
13.50-14.45: Breakout group wrap-ups and community paper planning

14.45-15.00: Final remarks

Poster Presentations: Posters are assigned to either Poster Session A (with sessions on Monday and Tuesday) or Poster Session B (with sessions on Wednesday and Thursday). Please plan to present your poster during one of your assigned poster days.

Poster Session A:
A1. Leo Saffin: Eddy Feedbacks in CMIP6 Models
A2. Eswyn Chen: Resolution dependence of surface forcing within North Atlantic extratropical cyclones and possible role for the signal-to-noise paradox
A3. Robert Jnglin Wills: Resolving weather fronts increases the large-scale circulation response to Gulf Stream SST anomalies
A4. Priyanka Ghosh: Momentum Flux and Vertical Wind Power Spectral Characteristics in
the Troposphere and Lower Stratosphere Over Andøya, Norway as Observed by MAARSY

A6. Y. Qiang Sun (presented by Pedram Hassanzadeh): Sub-filter Scale Waves or Sub-grid Scale Waves? Quantifying 3D Gravity Wave Forcing in Convection-Permitting Simulations for Data-Driven Parameterizations
A8. Shingo Watanabe: Does better tropospheric circulation bring better QBO?
A10. Alison Ming: Ozone-QBO interactions: a perspective using idealized calculations
A12. Bhupendra Bahadur Singh: Upper tropospheric moistening during the Asian summer monsoon in a changing climate
A13. Alexey Karpechko Northern Hemisphere Stratosphere-Troposphere Circulation Change in CMIP6 Models
A15. Darryn Waugh: Nonlinearity of Atmospheric Circulation response to increased CO2
A17. Chaim Garfinkel: Stationary Waves Weaken and Delay the Near-Surface Response to Stratospheric Ozone Depletion
A18. Chaim Garfinkel: Impact of parameterized convection on the storm track and jet stream response to global warming: implications for mechanisms of the future poleward shift
A19. Chaim Garfinkel: Revisiting the utility of the Matsuno index of refraction for wave propagation into, and reflection from, the stratosphere
A20. Or Hess: Anthropogenic forcings reverse a multi-century naturally-forced Hadley cell intensification
A21. Erez Aviv: Climate Change Effect on the Eddy-Driven Jet Meandering and the Connection to Extreme Events
A22. Juho Koskentausta: The impact of Arctic sea ice loss on Eurasian winter climate simulated by ECHAM6
A23. Ralf Jaiser: The Impact of Sea Ice Concentration and Sea Surface Temperature Boundary Forcing in different Experimental Setups with ECHAM6 on the Polar Stratosphere
A24. Yvonne Anderson: The effect of Arctic sea ice loss on North Atlantic jet stream morphology and variability
A26. Deepashree Dutta: Low orography and high methane drive Arctic amplification
A27. Satoru Okajima: Distinct roles of cyclones and anticyclones in setting the midwinter minimum of the North Pacific eddy activity: a Lagrangian perspective
A28. Dor Sandler: Localized Finite Amplitude Wave Activity as a Diagnostic for Mediterranean Cyclones and their Large Scale Drivers
A29. Chiem van Straaten: Drivers of Mediterranean winter drought
A30. Nour-Eddine Omrani: Coupled stratosphere-troposphere-Atlantic multidecadal oscillation and its importance for near-future climate projection
A32. Jakob Schloer: Characterizing Nonlinearities in ENSO Dynamics using Hybrid Machine Learning Models
A33. Luke Davis: Relationship between cloud feedbacks and the large-scale circulation across CMIP5 and CMIP6
A34. Gloria Manney (presented by Zachary Lawrence): Relationships between stratospheric polar vortex, upper tropospheric jet, and tropopause variability (and cold air outbreaks)

Poster Session B:

B1. Mark P. Baldwin: Surface Amplification of Stratosphere-Troposphere Coupling
B2. Daniela I.V. Domeisen: The role of zonally propagating waves for stratosphere-troposphere coupling: Mechanisms and model biases
B3. Hyeong-Oh Cho: Possible Impact of the 2019 Southern Hemisphere Stratospheric Sudden Warming on Tropical Cyclone activities over the western North Pacific
B4. Dong-Chan Hong: Downward coupling of 2018 Sudden Stratospheric Warmings in SNAPSI nudging experiments
B5. Xiaocen Shen: The Dominant Intraseasonal Coupling Mode between the Stratosphere and Troposphere: Stratosphere-Troposphere Oscillation
B6. Raphael Köhler: How do different pathways connect the stratospheric polar vortex to its tropospheric precursors?
B7. Zachary Lawrence: Process-oriented diagnostics of dynamical coupling between the troposphere and stratosphere in Earth System Models
B8. Sheena Loeffel: Which sudden stratospheric warming events are more likely to produce a tropospheric response?
B9. Kamilya Yessimbet: Observational perspective on SSWs and blocking from E-P fluxes
B10. Shunsuke Noguchi: Ocean Circulation Responses in a Stratospheric Nudging Experiment by an Earth System Model: A Case Study for the Abnormal 2019-2020 Season
B11. Ryan Williams: Attributing the role of the strong stratospheric polar vortex on serial extratropical cyclone clustering in the North Atlantic in February 2022
B12. Natalia Calvo: On the anomalous wave forcing preceding SSWs during ENSO events
B13. Jacopo Riboldi: How are the shape and the propagation of Rossby waves changing during SSW and SPV events?
B14. Kathrin Finke: The stratospheric polar vortex and surface effects: The case of the North American 2018/19 cold winter
B15. Weronika Osmolska: Large-scale Dynamical Controls on Cold Air Outbreaks
B16. Phillip Rupp: Coupled planetary wave dynamics in the polar stratosphere and their contribution to polar vortex variability
B17. Alexey Karpechko: The tropical influence on sub-seasonal predictability of wintertime stratosphere and stratosphere-troposphere coupling
B18. Ming Bao: Influence of Preconditioned Stratospheric State on the Surface Response to Displacement and Split Sudden Stratospheric Warmings
B19. Toshihiko Hirooka: Downward propagation of wave packets from the stratosphere and their influences on cold spells during the Northern Hemisphere winter

B20. Andrew Charlton-Perez: Impact of SSW events on human mortality

B21. Amy Butler: A vertically coherent perspective of sinuosity and its ties to climate extremes on S2S timescales

B22. Hasanain Al-Shamarti: Circulation aspects associated with heat wave events over Iraq and their associated sub-seasonal predictability

B23. Valeriy Khokhlov: Impact of atmospheric circulation on extreme weather in Ukraine

B24. Kai Kornhuber: Recent increase in a recurrent pan-Atlantic wave-pattern driving concurrent wintertime extremes

B25. Irina Rudeva: What modulates the extreme rainfall in Southeastern Australia?

B26. Yuxuan Ding: Influences of Meteorological Conditions and Cloud Properties on Precipitation in Atmospheric Rivers: Taking the “712” Beijing-Tianjin-Hebei Extreme Precipitation as an Example

B27. Msawenkosi Thabo Mpanza: Further probing the mechanisms driving projected decreases of extreme precipitation intensity over the subtropical Atlantic.


B29. Chaim Garfinkel: Revisiting the signal-to-noise paradox in S2S models: role of synoptic eddy feedback

B30. Qingyu Cai: Influence of the Quasi-Biennial Oscillation on the Spatial Structure of the Wintertime Arctic Oscillation

B31. Tianjiao Ma: Nonlinear effects of the stratospheric Quasi-Biennial Oscillation and ENSO on the North Atlantic winter atmospheric circulation

B32. Neal Butchart: QBO extratropical teleconnections in nudged and free-running experiments

B33. Hiroaki Naoe: Teleconnections of the quasi-biennial oscillation in multi-model QBOi-ENSO simulations

B34. Vinay Kumar: QBO modulations in surface climate of high latitudes during boreal winter
Links:


Presentation upload:
[https://cloud.physik.lmu.de/index.php/s/rzPkJ9J76pHr](https://cloud.physik.lmu.de/index.php/s/rzPkJ9J76pHr)
Password: Munich2023

Local information guide: [Local Info Sheet.pdf](#)