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

DRAFT 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, Chairs:
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)
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, Chairs:
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), Chairs:
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
16.55-17.10: **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 1 and Ice Breaker

**Tuesday, 10 October 2023**

8.45-9.00 Announcements
**Session 3: Climate models and biases**, Chairs:
9.00-9.20: **Christiane Jablonowski** (invited), Tropical Stratosphere-Troposphere Interactions in Selected 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
10.05-10.20: **Yuan-Bing Zhao**, Atmospheric bias responses to regional systematic SST errors: background-SST dependence and geographical dependence
10.20-10.35: **Xinhuiyu Liu**, Implications of warm pool bias in CMIP6 models on the Northern Hemisphere wintertime subtropical jet and precipitation
10.35-11.00: coffee break

**Session 3: Climate models and biases (cont’d)**, Chairs:
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?

**Breakout 2**
11.30-11.45: **Jonathon Wright**, Expanding Stratosphere Troposphere Coupling Evaluations in the SPARC-Reanalysis Intercomparison Project Phase 2 (S-RIP2): Planned S-RIP Phase 1 Updates
11.45-12.30: Panel Discussion/breakout group on “Interaction of DynVar and SNAP with other SPARC activities”
12.30-14.00: Lunch break (LESFMIP single forcing lunch meeting)

**Session 4: Extratropical Dynamics**, Chairs:
14.00-14.15: **Hisashi Nakamura**, Cyclonic and anticyclonic contributions to the midwinter minimum of the North Pacific storm-track activity
14.15-14.30: **Alice Portal**, Atmospheric circulation anomalies resulting from cold East-Asian orography in climate models
14.30-14.45: **Christopher Polster**, A new atmospheric background state to diagnose local waveguidability
14.45-15.00: **Ian White**, On the Role of Midlatitude Diabatic Heating in the Extratropical Circulation
15.00-15.15: **Pedram Hassanzadeh**, The Intrinsic 150-Day Periodicity of the Southern Hemisphere Extratropical Large-Scale Atmospheric Circulation
15.15-15.30: **Morio Nakayama**, Impacts of a Midlatitude Oceanic Frontal Zone on the Southern Baroclinic Annular Mode
15.30-15.50: **Poster session 1 and coffee break**

**Session 5: Tropical processes**, Chairs:
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**

**Wednesday, 11 October 2023**

8.45-9.00 Announcements

**Session 6: Stratospheric circulation changes and interactions with chemistry**, Chairs:
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 2 and coffee break**
Session 6: Stratospheric circulation changes and interactions with chemistry (cont'd), Chairs:
11.50-12.05: Ewa Bednarz, Impact of the latitude of stratospheric aerosol injection on the stratosphere-troposphere coupling
12.05-12.20: Khalil Karami, The Stratospheric Aerosol Intervention affects the Stratospheric Polar Vortex. But which aspect of the vortex undergoes the greatest change?

Session 7: North Atlantic Decadal Variability, Chairs:
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 and Optional Social Activity

Thursday, 12 October 2023

8.45-9.00 Announcements
Session 8: Stratosphere-troposphere coupling and biases in S2S models, Chairs:
9.00-9.20: Peter Hitchcock (invited), Mechanisms of stratospheric influence on surface weather: insights from SNAPS1 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

10.10-10.35: coffee break

Session 9: S2S predictability of extremes, Chairs:
10.35-10.55: William Seviour (invited), Attributing the role of sudden stratospheric warming events in surface weather extremes
10.55-11.10: Jinlong Huang, Stratospheric Influence on the Development of the 2018 Late Winter European Cold Air Outbreak
11.10-11.25: Irina Statnaia, Factors influencing subseasonal predictability of Northern Eurasian cold spells

Breakout 3
11.25-12.25: Breakout group discussion on “Bridging prediction and projections: Future collaborations and directions of DynVar and SNAP”
12.25-13.55: Lunch break (SNAP lunch)

**Session 9: S2S predictability of extremes (cont’d), Chairs:**
13.55-14.10: Xiuyuan Ding, Stratospheric Wave Precursor of Cold Events over North America
14.25-14.40: Andrea Lopez Lang, A multiscale perspective of the dynamics of North American winter extremes
14.40-14.55: Vikki Thompson, Large Scale Dynamics of the Western European flooding of July 2021
14.55-15.10: Justin Finkel, Revealing the Statistics of Extreme Events Hidden in Short Weather Forecast Data

15.10-16.50: Poster session 2 and coffee break

**Session 10: Stratosphere-troposphere coupling and surface predictability, Chairs:**
16.50-17.10: Hera Kim (invited), Quantification of the stratospheric contribution to surface predictability
17.10-17.25: Robert Lee, Fitting a minimal model to investigate S2S hindcast predictability associated with stratosphere-troposphere coupling
17.25-17.40: Verónica Martínez-Andradas, Precursors of the North Atlantic jet response to sudden stratospheric warmings
17.40-17.55: 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, Chairs:**
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), Chairs:**
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, Chairs:
11.20-11.35: Sohan Suresan, 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, The climate response after high latitude volcanic eruptions: Implications for NA weather regimes and extreme events

12.20-13.50: Lunch break (SNAPSI hackathon and next steps)

Breakout 4
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 1 (with sessions on Monday and Tuesday) or Poster Session 2 (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
A6. Y. Qiang Sun: 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. Laura M Ciasto: Evaluation of the Stratosphere in the NCEP Conventional Observational Reanalysis (CORe)


A14. Bhupendra Bahadur Singh: Upper tropospheric moistening during the Asian summer monsoon in a changing climate

A15. Veenus Venugopal: Future evolution of stratospheric circulation: effect on ozone and water vapor distribution

A16. Federico Serva: Changes in stratospheric dynamics simulated by the EC-Earth model in CMIP experiments

A17. Alexey Karpechko: Northern Hemisphere Stratosphere-Troposphere Circulation Change in CMIP6 Models


A20. Darryn Waugh: Nonlinearity of Atmospheric Circulation response to increased CO2

A21. Gloria L Manney: Relationships between stratospheric polar vortex variability, upper tropospheric jet and tropopause variations, and tropospheric circulation variations related to cold air outbreaks


A23. Frederik Harzer: On the pattern of interannual polar vortex-ozone co-variability during northern hemisphere winter

A24. Chaim Garfinkel: Stationary Waves Weaken and Delay the Near-Surface Response to Stratospheric Ozone Depletion

A25. 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

A26. Chaim Garfinkel: Revisiting the utility of the Matsuno index of refraction for wave propagation into, and reflection from, the stratosphere

A27. Or Hess: Anthropogenic forcings reverse a multi-century naturally-forced Hadley cell intensification

A28. Erez Aviv: Climate Change Effect on the Eddy-Driven Jet Meandering and the Connection to Extreme Events

A29. Juho Koskentausta: The impact of Arctic sea ice loss on Eurasian winter climate simulated by ECHAM6

A30. Ralf Jaiser: The Impact of Sea Ice Concentration and Sea Surface Temperature Boundary Forcing in different Experimental Setups with ECHAM6 on the Polar
A31. Yvonne Anderson: The effect of Arctic sea ice loss on North Atlantic jet stream morphology and variability
A32. Jiankai Zhang: Important role of stratosphere-troposphere coupling in the Arctic mid-to-upper tropospheric warming in response to sea-ice loss
A33. Deepashree Dutta: Low orography and high methane drive Arctic amplification

A34. Satoru Okajima: Distinct roles of cyclones and anticyclones in setting the midwinter minimum of the North Pacific eddy activity: a Lagrangian perspective
A35. Dor Sandler: Localized Finite Amplitude Wave Activity as a Diagnostic for Mediterranean Cyclones and their Large Scale Drivers
A36. Chiem van Straaten: Drivers of Mediterranean winter drought

A37. Nour-Eddine Omrani: Coupled stratosphere-troposphere-Atlantic multidecadal oscillation and its importance for near-future climate projection
A38. Zoe Gillett: Linking ENSO to Synoptic Weather Systems in Eastern Australia

**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 Sudden Stratospheric Warming events in SNAPSI experiments: A comparison of February 2018 and January 2019 events
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 D. 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. Philip 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. Moshe Armon: Heavy precipitation where there’s no rainfall: Saharan rainfall climatology and its relationship with surface cyclones
B23. Hasanain Al-Shamarti: Circulation aspects associated with heat wave events over Iraq and their associated sub-seasonal predictability
B24. Valeriy Khokhlov: Impact of atmospheric circulation on extreme weather in Ukraine
B25. Kai Kornhuber: Recent increase in a recurrent pan-Atlantic wave-pattern driving concurrent wintertime
B26. Irina Rudeva: What modulates the extreme rainfall in Southeastern Australia?
B27. Chao He: Extremely hot East Asia and flooding western South Asia in the summer of 2022 tied to reversed flow over Tibetan Plateau
B28. Sourabh Bal: Assessment of COSMO-CLM model parameter sensitivity for extreme events over the eastern states of India
B29. 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
B30. Msawenkosi Thabo Mpanza: Further probing the mechanisms driving projected decreases of extreme precipitation intensity over the subtropical Atlantic.

B32. Chaim Garfinkel: Revisiting the signal-to-noise paradox in S2S models: role of synoptic eddy feedback
B33. Qingyu Cai: Influence of the Quasi-Biennial Oscillation on the Spatial Structure of the Wintertime Arctic Oscillation
B34. Tianjiao Ma: Nonlinear effects of the stratospheric Quasi-Biennial Oscillation and ENSO on the North Atlantic winter atmospheric circulation
B35. Neal Butchart: QBO extratropical teleconnections in nudged and free-running experiments
B36. Hiroaki Naoe: Teleconnections of the quasi-biennial oscillation in multi-model QBOi-ENSO simulations
B37. Vinay Kumar: QBO modulations in surface climate of high latitudes during boreal winter
B38. Khalil Karami: The Holton–Tan mechanism under stratospheric aerosol intervention