



# 2022 Gravity Wave Symposium

## SPARC GW Symposium 2022 –Frankfurt am Main

28 March – 1 April 2022

### Agenda



#### Monday 28 March

CEST (Central European Summer Time) = UTC+2

08:00 - 09:00 Check-In

#### Introduction / Orographic GW: Observations and Parameterization

Chair: Ulrich Achatz

09:00 - 09:15 Introduction

09:15 - 09:45 Sonja Gisinger<sup>1</sup>: Gravity wave dynamics in the hotspot region of the Southern Andes and the Antarctic Peninsula during the SOUTHTRAC-GW field campaign in Winter/Spring 2019

09:45 - 10:00 Natalie Kaifler: Middle atmosphere momentum fluxes due to multi-scale mountain waves as observed by an airborne lidar over the southern Andes

10:00 - 10:15 Carsten Eden: A Closure for Lee Wave Drag on the Large-Scale Ocean Circulation

10:15 - 10:30 Francois Lott: Mountain waves produced by a stratified shear flow with a boundary layer

10:30 - 11:00 Break

#### Orographic GW: Parameterization and Simulation

Chair: Joan Alexander

11:00 - 11:15 Annelize van Niekerk: Orographic gravity wave drag parametrization: accounting for multi-scale orography

11:15 - 11:30 Catrin I. Meyer: Evaluation of explicitly resolved orographic gravity waves in ICON simulations with AIRS satellite observations

11:30 - 12:00 Christopher Kruse: Observed and Modeled Mountain Waves from the Surface to the Mesosphere Near the Drake Passage

12:00 - 13:30 Lunch

#### Non-Orographic GW: Simulations and Observations

Chair: Laura Holt

13:30 - 14:00 Inna Polichtchouk: Resolved gravity waves in the stratosphere: Impact of increasing horizontal resolution from O(10 km) to O(1 km)

14:00 - 14:15 Wolfgang Woiwode: Non-orographic gravity waves and turbulence near the subtropical jet above the South Atlantic: SouthTRAC flight on 16 September 2019

14:15 - 14:30 Paola Rodriguez Imazio: Clear Air Turbulence observed across a tropopause fold over the Drake Passage: A Case Study

## Poster Session

14:30	-	16:00	Poster / Coffee
			<i>Eframir Franco-Diaz</i> : Gravity wave activity at 54 and 69 N observed by Lidar and AIRS satellite measurements
			<i>Albert Hertzog</i> : Strateole-2: long-duration balloon observations of gravity waves in the tropical lower stratosphere
			<i>Emily Lear</i> : Comparing Gravity Waves in a Kilometre-scale Run of the IFS to AIRS Satellite Observations
			<i>Ruth Lieberman</i> : The NASA Atmospheric Waves Experiment (AWE)
			<i>Facundo Poblet</i> : Horizontal correlation functions of wind fields in the MLT: Results from a Helmholtz decomposition.
			<i>Aurélien Podglajen</i> <sup>1</sup> : Assessment of inertia-gravity waves in ECMWF model forecasts and analyses using long-duration balloon observations
			<i>Zuzana Procházková</i> : Internal gravity wave detection in high-resolution model data
			<i>Mierk Schwabe</i> : Machine learning based gravity wave parameterizations for ICON

### Non-Orographic GW: Secondary GW

*Chair: Francois Lott*

16:00	-	16:30	Sharon Vadas: Gravity waves in the mesosphere and thermosphere from the polar vortex via multi-step vertical coupling
16:30	-	16:45	Mozhgan Amiramjadi <sup>1</sup> : Secondary Gravity Waves in the Mesosphere and lower thermosphere (MLT) in idealize simulations with the Upper-Atmosphere ICON model
16:45	-	17:00	Irina Strelnikova <sup>1</sup> : Decomposition of lidar observations into nearly monochromatic waves.
17:00	-	17:30	Isabell Krisch <sup>1</sup> : Gravity wave and PSC observations with ESA's Aeolus satellite
17:30		18:00	Break

### Non-Orographic GW: GW Sources

*Chair: Irina Strelnikova*

18:00	-	18:15	Yue Wu: Gravity wave emission from a lee-wave critical layer
18:15	-	18:30	Jie Gong: Solar Eclipse Impact on Gravity Wave Generation and Propagation in the Lower Atmosphere
18:30	-	18:45	Jia Yue: La Soufriere Volcanic Eruptions Launched Gravity Waves into Space
18:45	-	19:00	Corwin Wright: The 2022 Hunga Tonga Volcanic Eruption: Globally-Propagating Waves Observed from Surface to Ionosphere
19:00			Ice Breaker

## Tuesday 29 March

### Non-Orographic GW: Convective GW / UTLS

Chair: Corwin Wright

- 09:00 - 09:30 Min-Jee Kang: Role of convective gravity wave drag in the quasi-biennial oscillation disruption
- 09:30 - 09:45 Junhong Wei<sup>1</sup>: Global Distributions of Tropospheric and Stratospheric Gravity Wave Momentum Fluxes Resolved by the 9-km ECMWF Experiments
- 09:45 - 10:00 Yufang Tian: Statistical Characteristics and Possible Wave Sources of Inertia-gravity Waves in the Troposphere and Lower Stratosphere Observed by the Beijing MST radar
- 10:00 - 10:15 Michael Binder: Non-orographic GWs (NOGWs) excited by Propagating Tropopause Depressions - Idealized Numerical Simulations
- 10:15 - 10:30 Pramitha M: Meteor Radar Estimations of Gravity Wave Momentum Fluxes in the Mesosphere –Lower Thermosphere and their source spectra characterisation using Ray tracing modelling

### Poster Session

- 10:30 - 12:00 Poster / Coffee
- Colby Brabec* : Estimates of Gravity Wave Momentum Fluxes at the Stratopause from AIM/CIPS Satellite Data
- Andreas Dörnbrack*<sup>1</sup>: Stratospheric mountain waves trailing across Northern Europe
- Khalil Karami* : Assessing the impact of gravity waves on the stratospheric polar vortex by means of ICON model simulations
- Laura Köhler* : Comparing superpressure balloon gravity wave observations with high resolution models
- Haruka Okui*: Contribution of gravity waves to the universal vertical wavenumber spectra revealed by a gravity-wave permitting general circulation model
- Riwal Plougonven*: Comparison of orographic gravity waves in high-resolution simulations and in stratospheric balloon observations
- Gunter Stober*<sup>1</sup>: Assessing the spatial variability of mesosphere/lower thermospheric horizontal and vertical winds from multi-static meteor radar networks applying tomographic retrievals with a 3DVAR+div algorithm
- Nedjeljka Žagar*: How uncertain are the equatorial Kelvin waves in state-of-the-art analyses: insights from the ESA Doppler wind lidar mission Aeolus
- 12:00 - 13:30 Lunch

### Non-Orographic GW: Simulations / Observations / Parameterization / Decomposition Chair: Peter Preusse

- 13:30 - 13:45 Andreas Dörnbrack<sup>1</sup>: Stratospheric gravity waves excited by a propagating Rossby wave train - A DEEPWAVE Case Study
- 13:45 - 14:00 Milena Corcos: Observation of gravity waves at the tropical Tropopause using superpressure balloons
- 14:00 - 14:15 Gökce Tuba Masur: Balancing rotating shallow water flows in primitive variables
- 14:15 - 14:30 Christoph Zülicke<sup>1</sup>: Wave capture and diffusion limitation of jet-generated gravity waves
- 14:30 - 14:45 Tyler Mixa<sup>1</sup>: Evaluating the Impact of KHI Tube and Knot Dynamics as a Stratospheric Gravity Wave Source
- 14:45 - 15:00 Erich Becker<sup>1</sup>: Gravity waves generated by the polar vortex in January 2016 over Europe

**Poster Session**

15:00	-	16:00	Poster / Coffee
			<i>Fabienne Schmid</i> <sup>1</sup> : Towards a numerical laboratory for investigations of gravity-wave mean-flow interactions in the atmosphere
			<i>Ian Geraghty</i> : A Statistical Baseline of Gravity Waves Properties in the Mesosphere and Lower Thermosphere at McMurdo, Antarctica Derived From 10 Years of Lidar Observations
			<i>Dominika Hájková</i> : Parameterized orographic gravity wave drag in CMIP6 models, distribution, variability, trends and intermodel spread
			<i>Lars Hoffmann</i> : New AIRS and IASI high-resolution stratospheric temperature retrievals for gravity wave research
			<i>Stefanie Knobloch</i> <sup>1</sup> : Interaction of tropospheric and stratospheric jets during the 2019 sudden stratospheric warming: Implications for the excitation and propagation of orographic gravity waves
			<i>Tracy Moffat-Griffin</i> : MesoS2D: mesospheric sub-seasonal to decadal predictability

**Horizontal Propagation / Satellite Data / Lidar***Chair: Andreas Dörnbrack*

16:00	-	16:30	Neil Hindley: Atmospheric gravity waves from near the surface to the edge of space: new satellite observations, radar, numerical modelling and analyses
16:30	-	16:45	Sebastian Rhode <sup>1</sup> : Quantification of oblique orographic gravity wave propagation deduced from a mountain wave model
16:45	-	17:00	Markus Geldenhuys <sup>1</sup> : Gravity wave refraction: Cause and consequence
17:00	-	17:15	Lukas Krasauskas <sup>1</sup> : Oblique propagation of mountain waves to the upwind side of the Andes observed by GLORIA and ALIMA during the SouthTRAC campaign
17:15	-	17:30	Robert Reichert <sup>1</sup> : Estimates of momentum flux in the middle atmosphere using ground-based Rayleigh lidar temperature measurements and a linear Fourier ray model
17:30	-	18:00	Break

**Laboratory Experiments***Chair: Sonja Gisinger*

18:00	-	18:15	Joris Labarbe: Instabilities in stratified shear flows
18:15	-	18:30	Mark Schlutow <sup>1</sup> : How to study atmospheric gravity waves in the laboratory with a gas centrifuge
18:30	-	19:00	Costanza Rodda <sup>1</sup> : Gravity wave emission from jet systems in the differentially heated annulus experiment

## Wednesday 30 March

### GW Effects and Interaction: Turbulence and Clouds

Chair: Christoph Zülicke

09:00	-	09:30	Masashi Kohma: Estimation of turbulent energy dissipation rates in the mesosphere by a VHF radar in the Antarctic
09:30	-	09:45	Gerd Baumgarten: Noctilucent clouds “beautiful” tracers of mesoscale gravity waves and instabilities
09:45	-	10:00	Rakesh Teja Konduru: Explicit convection regional climate simulation of eastward propagating diurnal precipitation over south India: Role of gravity waves and mountain-plain-circulation
10:00	-	10:15	Stamen Dolaptchiev: Ice nucleation due to gravity waves
10:15	-	10:30	Robert Vicari: Understanding the distribution of convection wave signatures in water vapor sensitive satellite imagery
10:30	-	11:00	Break

### GW Effects and Interaction: Planetary Waves / Global Simulation / Satellite

Chair: Tyler Mixa

11:00	-	11:15	Aman Gupta: Gravity Wave Momentum Flux Estimation Across Observations, Reanalyses and High-Resolution Models
11:15	-	11:30	Ji-Hee Yoo: Compensation between planetary wave and orographic gravity wave forcing in the Northern Hemisphere winter stratosphere revealed in the CFSR reanalysis data
11:30	-	11:45	Andrea Schneidereit <sup>1</sup> : Explicit global simulation of gravity waves for different vertical grid resolutions
11:45	-	12:00	Peter Preusse <sup>1</sup> : The CAIRT Earth Explorer 11 mission: A way towards global GW momentum budgets
12:00	-	13:00	Lunch
13:00	-	16:00	Sightseeing

### Spectral Distribution: Simulations and statistics

Chair: Erich Becker

16:00	-	16:30	Claudia Christine Stephan <sup>1</sup> : Atmospheric energy spectra in kilometer-scale global simulations
16:30	-	16:45	Nedjeljka Žagar: Kinetic energy spectra of vertical motions in the hydrostatic atmosphere: a unified framework for the derivation of vertical velocities of the Rossby and inertia-gravity waves
16:45	-	17:00	Yanmichel Morfa Avalos: The Relationship Between Horizontal and Vertical Velocity Wavenumber Spectra in Global Storm-resolving Simulations
17:00	-	17:30	Hossein Kafiabad: Statistics of gravity waves shaped by balanced atmospheric flows
17:30	-	17:45	Break

### Spectral Distribution / Thermosphere Observations

Chair: Sebastian Rhode

17:45	-	18:00	Chihoko Cullens: Gravity Wave Observations from 90 to 250 km using ICON-MIGHTI instrument
18:00	-	18:15	Victor Avsarkisov: Investigation of mesoscale wind residuals in the MLT region over southern Patagonia
18:15	-	18:30	Priyanka Ghosh <sup>1</sup> : Spectral characteristics of horizontal and vertical wind fluctuations in the troposphere and lower stratosphere over Andøya, Norway (69.30°N, 16.04°E) revealed by MAARSY
18:30	-	19:00	Hanli Liu: Spectral structures of gravity wave momentum and heat fluxes in the middle and upper atmosphere
19:00			Dinner

## Thursday 31 March

### GW Effects and Interaction: Planetary Waves / Circulation

*Chair: Markus Geldenhuys*

09:00	-	09:30	Brentha Thurairajah: The Role of Gravity Waves in the Downward Progression of Stratospheric Temperature Anomalies during SSWs
09:30	-	09:45	Haruka Okui: Formation of a mesospheric inversion layer and the subsequent elevated stratopause associated with the major stratospheric sudden warming in 2018/19
09:45	-	10:00	Kaoru Sato: Roles of Rossby Waves, Rossby–Gravity Waves, and Gravity Waves Generated in the Middle Atmosphere for Interhemispheric Coupling
10:00	-	10:30	Petr Šácha: Interaction between parameterized orographic gravity wave drag and resolved dynamics in chemistry-climate models.
10:30	-	11:00	Break

### GW Effects and Interaction / Transport / Breaking

*Chair: Robert Reichert*

11:00	-	11:15	Laura Holt: Effects of Vertical Mixing from Orographic Gravity Wave Breaking on Circulation and Chemical Transport in the Stratosphere
11:15	-	11:30	Maria Vittoria Guarino: Towards a novel gravity wave transport parametrization for the WACCM model
11:30	-	11:45	Robin Wing: Gravity wave breaking associated with Mesospheric Inversion Layers as measured by the ship-borne BEM Monge lidar and ICON-MIGHTI
11:45	-	12:00	Uwe Harlander <sup>1</sup> : Two-dimensional internal gravity wave beam instability. Linear theory and subcritical instability
12:00	-	13:30	Lunch

### GW Effects and Interaction: QBO and SAO

*Chair: Mark Schlutow*

13:30	-	14:00	Young-Ha Kim <sup>1</sup> : Representation of convective gravity waves and a QBO simulation using ICON/MS-GWaM
14:00	-	14:15	M Joan Alexander: Identification of fine-vertical-scale tropical wave modes in Strateole-2 balloon observations: Implications for QBO forces in the lowermost stratosphere
14:15	-	14:30	Manfred Ern <sup>1</sup> : The semiannual oscillation (SAO) in the tropical middle atmosphere and its gravity wave driving in reanalyses and satellite observations
14:30	-	15:00	Martina Bramberger <sup>1</sup> : First measurements of fine-vertical-scale wave impacts on the tropical lower stratosphere

**Poster Session**

15:00 - 16:15 Poster  
*Timothy Banyard*: Atmospheric gravity waves in Aeolus wind lidar observations  
*Manfred Ern*<sup>1</sup>: Intermittency of gravity wave potential energies and absolute momentum fluxes derived from infrared limb sounding satellite observations  
*Aleš Kuchař*: On the impact of the Himalayas on the polar vortex morphology  
*Ofer Shamir*: The gravity wave parameterization calibration problem: A 1D QBO model testbed  
*Shuang Xu*: A global view of stratopause gravity waves derived from CIPS RAA data

16:15 - 17:30 Poster  
*Jonathan Coney*: Deep learning techniques for gravity wave detection in NWP model output  
*Jackson Jandreau*: Analyzing lidar observations over McMurdo, Antarctica to investigate vertical development of gravity wave energy in the stratosphere and mesosphere  
*Constantino Listowski*: Infrasound propagation investigated using high-resolution global models resolving gravity waves in the stratosphere  
*Dana McGuffin*: Observation of Gravity Waves from Satellites Using Atmospheric Stellar Occultation  
*Valentino Neduhai*: Modal decomposition of the vertical momentum fluxes

**GW Effects and Interaction(Turbulence) / Parameterization***Chair: Costanza Rodda*

17:30 - 17:45 Thomas Ehrmann: Determining Stratospheric Turbulence Statistics from ER-2 Flight Data  
 17:45 - 18:00 Abhiram Doddi: Multi-Scale Dynamics of Kelvin-Helmholtz Instabilities Modulated by High-Frequency, Low-Amplitude Gravity Waves  
 18:00 - 18:15 Brenda Quinn: Application of the IDEMIX Concept for Internal Gravity Waves in the Atmosphere  
 18:15 - 18:30 Valery Yudin: Resolved and Parameterized Gravity Waves in Global Forecast System of NOAA  
 18:30 - 19:00 Aditi Sheshadri: A machine learning parameterization of gravity wave drag coupled to an atmospheric GCM

## Friday 1 April

### Parameterization

*Chair: Claudia Stephan*

09:00	-	09:30	Shingo Watanabe: Application of Deep Learning to Estimate Atmospheric Gravity Wave Parameters in Reanalysis Data Sets
09:30	-	09:45	Lucia Yang: Neural network emulators for gravity wave parameterizations
09:45	-	10:00	David Connelly: Machine learning for gravity wave parameterization: regression tree ensemble approaches
10:00	-	10:15	Roland Eichinger: Horizontal redistribution of orographic gravity wave flux in a global climate model
10:15	-	10:30	Georg Sebastian Völker <sup>1</sup> : Towards a transient gravity wave parametrization in atmospheric models
10:30	-	11:00	Break
11:00	-	13:00	<b>Discussion</b>
13:00			Lunch
15:00			Sightseeing
19:00			Dinner

Time slots:    Invited talks: (25 + 5 min)  
                  Contributed talks: (12 + 3 min)

---

<sup>1</sup> (former) member of MS-GWaves, or strongly related