EP 4: Near-Earth Space

Time: Wednesday 11:00–12:00 Location: KH 01.019

Invited Talk EP 4.1 Wed 11:00 KH 01.019

Assessing the immediate dynamical and long-term radiative effects of the Hunga Tonga Hunga Ha'apai volcanic eruption using state-of-art active and passive ground-based remote sensing — •Gunter Stober — University of Bern, Institute of Applied Physics, Bern, Switzerland — Oeschger Center for Climate Change Research, Bern, Switzerland

The Hunga Tonga Hunga Ha'apai (HTHH) volcanic eruption on 15th January 2022 launched atmospheric gravity waves (GW) traveling around the entire globe, reaching altitudes up to the mesosphere/ lower thermosphere (MLT) and even beyond that height. These GW had unprecedentedly high phase speeds of 170-240 m/s and reached amplitudes of 40- 50 m/s in the zonal and meridional wind components. Global available meteor radar observations of MLT winds together with multistatic meteor radar networks and high-resolution gravity wave modeling with the High Altitude Mechanistic Circulation Model (HIAMCM) reveal the global propagation of the volcanic GW and their global propagation for more than 24 hours.

However, the larger impact of the HTHH eruption is caused by the released water vapor. The volcanic plume injected about 13 Tg of water vapor into the stratosphere and mesosphere. Due to residual circulation, this water vapor is now distributed around the globe and observed by both ground-based and space-borne sensors. Here, we present observations of ground-based and balloon-borne sensors to measure the excess water vapor due to HTHH in the middle atmosphere.

EP 4.2 Wed 11:30 KH 01.019

Midlatitude impact of the extreme geomagnetic storm of May 10/11, 2024 — •Miriam Sinnhuber[1], Chao Yue[2], and Yuxuan Li[2] — [1]Karlsruhe Institute of Technology, Karlsruhe, Germany — [2]Peking University, Bejing, China

On May 10-11, two CMEs arriving within few hours initiated the first extreme geomagnetic storm since the Halloween storm of October/November 2003. Polar lights were clearly visible well into midlatitudes, down to the Alps in Germany. Here, we use fluxes of precipitating electrons from the Chinese FengYun 3E satellite to derive rates of midlatitude ionization. These ionization rates are discussed and compared to observations of NO and N2O in the mesosphere obtained from the ACE-FTS/SCISAT.

EP 4.3 Wed 11:45 KH 01.019

EPP-NOy Upper-Boundary Condition, validation and long-term trends — •Stefan Bender[1], Bernd Funke[1], Manuel López Puertas[1], Gabriele Stiller[2], Peter Bernath[3], and Christopher Boone[3] — [1]IAA-CSIC, Granada, Spain — [2]KIT, Karlsruhe, Germany — [3]University of Waterloo, Waterloo, Canada

Polar winter descent of NOy produced by energetic particle precipitation (EPP) in the mesosphere and lower thermosphere affects polar stratospheric ozone by catalytic reactions. This, in turn, may affect regional climate via radiative and dynamical feedbacks. NOy observations by MIPAS/Envisat during 2002–2012 have provided observational constraints on the solar-activity modulated variability of stratospheric EPP-NOy. These constraints have been used to formulate a chemical upper boundary condition (UBC) for climate models in the context of solar forcing recommendations. We have updated the UBC with the recently released, reprocessed MIPAS version 8 data. We compare this updated NOy UBC model to data from the ACE-FTS solar occultation instrument which has been providing measurements since 2004 and is still actively providing data today. This 20+-year, long-term dataset will enable us to assess the validity of the assumptions underlying the UBC model, such as its climatological approach. Any deviation will enable us to assess the projected, climate-change induced changes in middle atmospheric transport, e.g. via the Brewer-Dobson circulation.