610

ICESTAR: OBSERVATIONS OF ENERGETIC PARTICLE EFFECTS ON THE POLAR MIDDLE-ATMOSPHERE

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A large solar disturbance like a flare or a coronal mass ejection can result in emission of high-energy protons and other ions from the Sun. If these particles reach the Earth they set off an event known as a Solar Proton Event. In addition to these events the Earth continuously undergoes precipitation of energetic charged particles originating from the near-earth space. The charged particles precipitate into the Earth's atmosphere causing ionization in the middle atmosphere. The primary effect is confined to the polar cap regions, where the particles are guided by the magnetic field. In the atmosphere the enhanced ionization leads to increased production of odd nitrogen (NO_x) and odd hydrogen (HO_x) which participate in catalytic reaction cycles decreasing the amount of ozone. HO_x gases have a short chemical lifetime but the NO_x

gases are mainly destroyed by photodissociation. Hence during polar winter, when little or no sunlight is available in the atmosphere, the effect of the NO_x cycles can be long-lasting and extend outside the polar cap regions though transport processes in the atmosphere.

We have used ozone and NO_2 observations from the GOMOS instrument on board the Envisat satellite to study the effects of energetic particle precipitation on the middle-atmosphere. Both solar storm and non-solar-storm related energetic particle precipitation cases have been considered. GOMOS observations indicate that high energy particle forcing has a great impact on the stratospheric and mesospheric composition.