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Observation of gravity waves by limb-viewing satellite instruments: Impact of the measuring direction on the observational-filter effect

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Limb-viewing satellite instruments are often used to observe atmospheric gravity waves (GW) on global scales. Derived parameters (amplitudes, wavelengths...) give information about GW activity, for example, as input for models. However, small-scale processes like GWs cannot be completely resolved by remote sensing instruments because they integrate over relatively large air volumes along their ray-of-sight, known as the observational-filter effect.
Radiosonde measurements are used as reference to temperature profiles of the satellite-based instrument TIMED/SABER in order to compare signatures of present GWs in both data sets. Results show that among known aspects (e.g. the wavelengths) the measuring direction of the satellite with regard to the direction of wave propagation influences the intensity of the observational-filter effect. If GWs have a prevailing orientation in particular regions, e.g. orographic induced GWs, this leads to systematic errors in observed GW activity derived by satellite instruments. Since the wave orientation cannot be determined solely by the temperature profiles of an instrument, it is not possible to specify a general correction function for this effect. This implies a need for the development of improved techniques concerning the measuring geometry of satellite instruments.