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## Formation of ice supersaturation by mesoscale gravity waves

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**Abstract.** We investigate the formation and evolution of an ice-supersaturated region (ISSR) that was detected by means of an operational radiosonde sounding launched from the meteorological station of Lindenberg on 21 March 2000, 00:00 UTC. The supersaturated layer was situated below the local tropopause, between 320 and 408 hPa altitude. Our investigation uses satellite imagery from METEOSAT and the Advanced Very High Resolution Radiometer (AVHRR) and analyses of the European Centre for Medium-Range Weather Forecasts (ECMWF). Mesoscale simulations reveal that the ISSR was formed by a temporary vertical uplift of upper tropospheric air parcels by 20 to 40 hPa in 1 to 2 h. This resulted in a significant local increase of the specific humidity by the moisture transport from below. The ascent was triggered by the superposition of two internal gravity waves, a mountain wave induced by flow past the Erzgebirge and Riesengebirge south of Lindenberg, and an inertial gravity wave excited by the anti-cyclonically curved jet stream over the Baltic Sea. The wave-induced ISSR was rather thick with a depth of about 2 km. The wave-induced upward motion causing the supersaturation also triggered the formation of a cirrus cloud. METEOSAT imagery shows that the cirrus cloud got optically thick within two hours. During this period another longer lasting thin but extended cirrus existed just beneath the tropopause. The wave-induced ISSR disappeared after about half a day in accordance with the decaying wave activity.

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