

## 5. Simulation of a polar low over the Japan Sea

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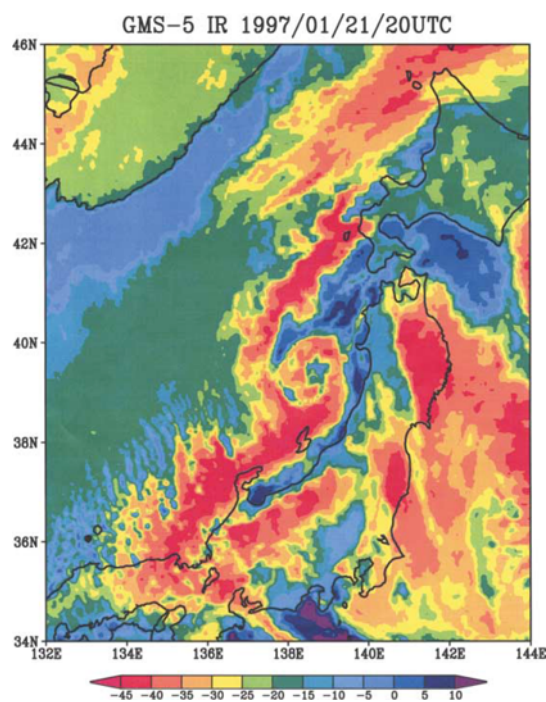


Fig.1 GMS-5 IR data at 20UTC 21 January 1997 (The original data provided by the Japan Meteorological Agency).

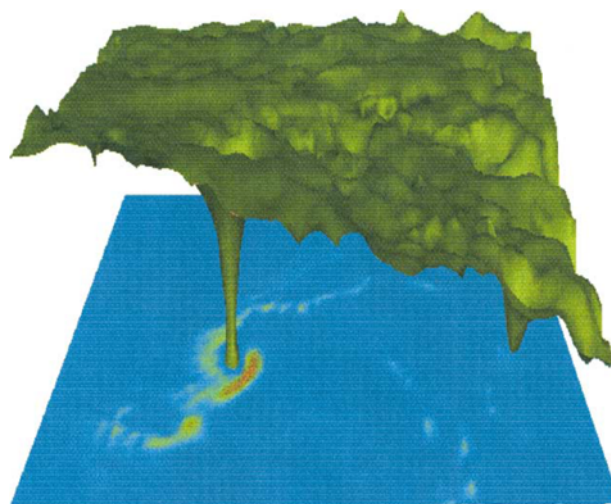


Fig.2 The simulated polar low at 18UTC 21 January 1997.

Polar lows are intense mesoscale cyclones that form in cold air streams of the polar airmass. Their horizontal scales are on the order of several hundred kilometers, and their entire life time range from several hours to several days. They usually develop in winter over the high-latitude oceans such as, the Gulf of Alaska, the Barents Sea and the Norwegian Sea. On satellite images, polar lows are frequently characterized by spiral or comma-shaped cloud patterns and are even associated with a clear "eye" structure at their mature stage. The Japan Sea is located at the lowest latitude among the oceans where polar lows frequently occur. Figure I shows a GMS-5 IR (infrared) image of a polar low over the Japan Sea at 20UTC 21 January 1997. The polar low has a remarkable spiral cloud pattern and a clear "eye" structure which are similar to those found in a typhoon\*. Figure 2 presents the 3-D structure of polar low based on the simulation result of MRI-NHM (Meteorological Research Institute Non-Hydrostatic Model)\*\* valid at 18UTC 21 January 1997. The yellow-green color represents the isentropic surface of 271.5K. The "warm core" structure near the center of the vortex is caused by adiabatic warming due to a downdraft and is clearly visualized by the funnel-like isentropic surface which almost reaches the sea surface. The horizontal distribution of the rainbow color shows snow mixing ratio  $q$  near the sea surface which corresponds well to the spiral-shaped cloud pattern and the "eye" structure as seen in the satellite picture.

\* Fu, Gang, An observational and numerical study on polar lows over the Japan Sea, Ph.D thesis of the University of Tokyo, 1999.

\*\* Saito, K., Semi-implicit fully compressible version of the MRI mesoscale nonhydrostatic model — Forecast experiment of the 6 August 1993 Kagoshima Torrential Rain—, Geophys. Mag. Ser., 2 (1997), 109-139.