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The Lofotes low and its role in northern hemisphere wintertime circulation

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The mean sea level pressure (SLP) field over the northern hemisphere wintertime is characterized by five prominent pressure patterns: Two low pressure systems (Icelandic low, Aleutian low) and three high pressure systems (Siberian high, Azores high and Pacific/North American high). The SLP distribution over the North Atlantic is dominated by the Icelandic low. From there a zone of low pressure extends towards NE, which even shows a separate low pressure core over the Norwegian Sea/Barents Sea (called Lofotes low (LL) in this paper). The characteristics of the LL in time, vertical and horizontal dimension are studied on the basis of monthly mean SLP fields for the winter months December, January, and February for the period 1957 - 2002 using ERA-40 reanalyzes.

In about one third of the time the LL is the dominating low over the North Atlantic (lower than the Icelandic low (IL)). Using the SLP difference between the IL and LL region an index characterizing the meridional circulation over the NE Atlantic is defined (I-L-index). Conditional sampling of the northern hemisphere SLP for high and low values of the I-L-index shows a clear E-W pressure seesaw (I-L-oscillation) with centers SW of Iceland and over NW-Russia. Interestingly a strong SLP signal is also formed over the Aleutian low area (lower Aleutian low when a LL is present), but only a very weak signal over the Azores high. The latter is also reflected by a very small correlation between I-L-Index and NAO-Index. A pressure pattern similar to the SLP pattern extends throughout the entire troposphere. In the upper troposphere and particularly in the stratosphere another strong pressure signal emerges over the Siberian high area (higher pressure than normal when LL is present). The I-L-oscillation and the I-L-index are discussed in relation to the Barents Sea oscillation (Skeie, GRL 2000) and the position of the wave number two phase (Cavalieri and Hakkinen, GRL 2001).