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## Sensitivity of the tropospheric circulation to changes in the strength of the stratospheric polar vortex

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The sensitivity of the wintertime tropospheric circulation to changes in the strength of the Northern Hemisphere stratospheric polar vortex is studied using one of the latest versions of the ECMWF model. Three sets of experiments were carried out: a set of control integrations, and two sets of integrations in which the strength of the stratospheric polar vortex has been gradually reduced and increased, respectively, during the course of the integration. The strength of the polar vortex is changed by applying a forcing to the model tendencies in the stratosphere only. The forcing has been obtained using the adjoint technique.

It is shown that in the ECMWF model changes in the strength of the polar vortex in the middle and lower stratosphere have a significant and slightly delayed (on the order of days) impact on the tropospheric circulation. The tropospheric response shows some resemblance to the NAO; the centres of action, though, are slightly shifted towards the east compared to those of the NAO. The tropospheric response over the North Pacific and North America is rather small. Furthermore, a separate comparison of the response to a weak and strong vortex forcing suggest that the first order tropospheric response is linear. From the results presented, it is argued that particularly extended-range forecasts in the European area benefit from the stratosphere-troposphere link.