



Signatures of Climate Patterns upon Stratospheric Ozone

Y. Orsolini (1) and F. Doblas-Reyes (2)

(1) Norwegian Institute for Air Research, Norway, (2) ECMWF, Reading, UK
(orsolini@nilu.no)

We examine the influence of low-frequency tropospheric dynamics upon column ozone inter-annual variability, with a focus over the Euro-Atlantic sector. This dynamical variability of tropospheric origin can be analysed in terms of leading climate patterns, derived by applying an empirical orthogonal function analysis for example. In order to fingerprint the spatial and temporal ozone signatures of these patterns, the TOMS satellite observations of column ozone during the last two decades are used. We hence demonstrate that a series of climate pattern modulate ozone variability and trends in middle latitudes with characteristic regional signatures. Such is the case for not only the North Atlantic Oscillation, but also the Scandinavian pattern and European blocking pattern.

Moreover, there is recent evidence that climate variations over the North Pacific and Atlantic sectors are coupled in late winter, resulting in an Aleutian-Icelandic seesaw that modulates upward propagation of planetary waves into the stratosphere, and induces a strong ozone signature.

Finally, we examine how the transient, synoptic-scale ozone variability is influenced by the low-frequency climate patterns. In particular, we demonstrate that the slow-varying flow steers the pathways of ozone mini-holes.

This dynamical contribution of climate patterns upon the regional ozone trends and inter-annual variability is a manifestation of troposphere-stratosphere interaction. The relative importance, or even the shape of the main patterns of climate variability are

likely to change in an evolving atmosphere due to compositional modifications of anthropogenic origin. Understanding the ozone impact of such climate patterns in a changing atmosphere is necessary to assess future local ozone trends.