Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02649, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02649
EGU General Assembly 2008


# Atmospheric transport towards the Iberian Peninsula in the 3- to 10-day range.

R. Nieto (1,2), L. Gimeno (1) and L. de la Torre (1)

(1) Universidad de Vigo, Dpto Física Aplicada, Facultad de Ciencias de Ourense, Ourense, Spain. (2) University of Lisbon, CGUL, IDL, Lisbon, Portugal.

Atmospheric transport on timescales of the order of 3–10 days is crucial for substances that have a lifetime within this range. This involves many different substances, such as ozone ($O_3$) and its precursors, aerosols, mercury, or persistent organic pollutants. During the last years, different research projects around the world have performed field campaigns along the Iberian coasts, measuring air pollutants in the troposphere. Some of them evidenced that the formation and distribution of primary pollutants in urban plumes, at regional or continental scales, in the boundary layer and in the free troposphere, are linked together. Due to the westerly direction of dominant winds in extratropical latitudes, the most probable source of Spanish pollutants at an intercontinental scale should be North America. However, there are several studies that point out that pollutants from North America are hardly ever observed at ground sites in Europe. Depending on the meteorological situation, some type of pollution layer can be transported all the way to Europe (Li et al., 2002). From a dynamic point of view, the major processes responsible for vertical uplifting of polluted air masses to higher altitudes over the U.S. are synoptic-scale warm conveyor belts (WCBs) associated with frontal systems. Pollutants can easily enter into the jet stream and be transported rapidly to Europe, where they are transported to the mid-upper troposphere. Europe frequently receives the outflow from WCBs that originate along the eastern North American coast. The period selected in this work (3–10 days) has the typical timescale of a WCB transport (Eckhardt et al., 2004).

New advanced Lagrangian atmospheric transport models enable us to establish, almost unambiguously, source-receptor relationships over long distances that correspond to

10 days of transport. The study reported herein aims at characterizing the pathways for these middle-lived substances arriving in the Iberian Peninsula by using the successful Lagrangian particle dispersion model FLEXPART (Stohl et al., 1998) and meteorological analysis data from the European Centre for Medium-Range Weather Forecasts (ECMWF). A period of 5 years, 2000–2003, was analyzed.

Three conclusions can be extracted from this study (Nieto and Gimeno, 2006): 1) Transatlantic transport is the main pathway of the air reaching the Iberian Peninsula in the studied range of 3–10 days. 2) The importance of local sources is limited to the 3rd day of transport. 3) The pattern of residence of particles during the 10th day of transport confirms the clear influence of North American sources over the Iberian Peninsula.

These conclusions are in agreement with previous studies of the intercontinental transport of pollutants and aerosols. Due to the strong anthropogenic-produced aerosols and pollutant emissions in the eastern half of North America, this region is the main potential contributor to the middle-lived pollutants over the Iberian Peninsula advected from outside.

**Keyword**: sources of middle-lived pollutants, sources of aerosols, Lagrangian atmospheric transport model, Iberian Peninsula.

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