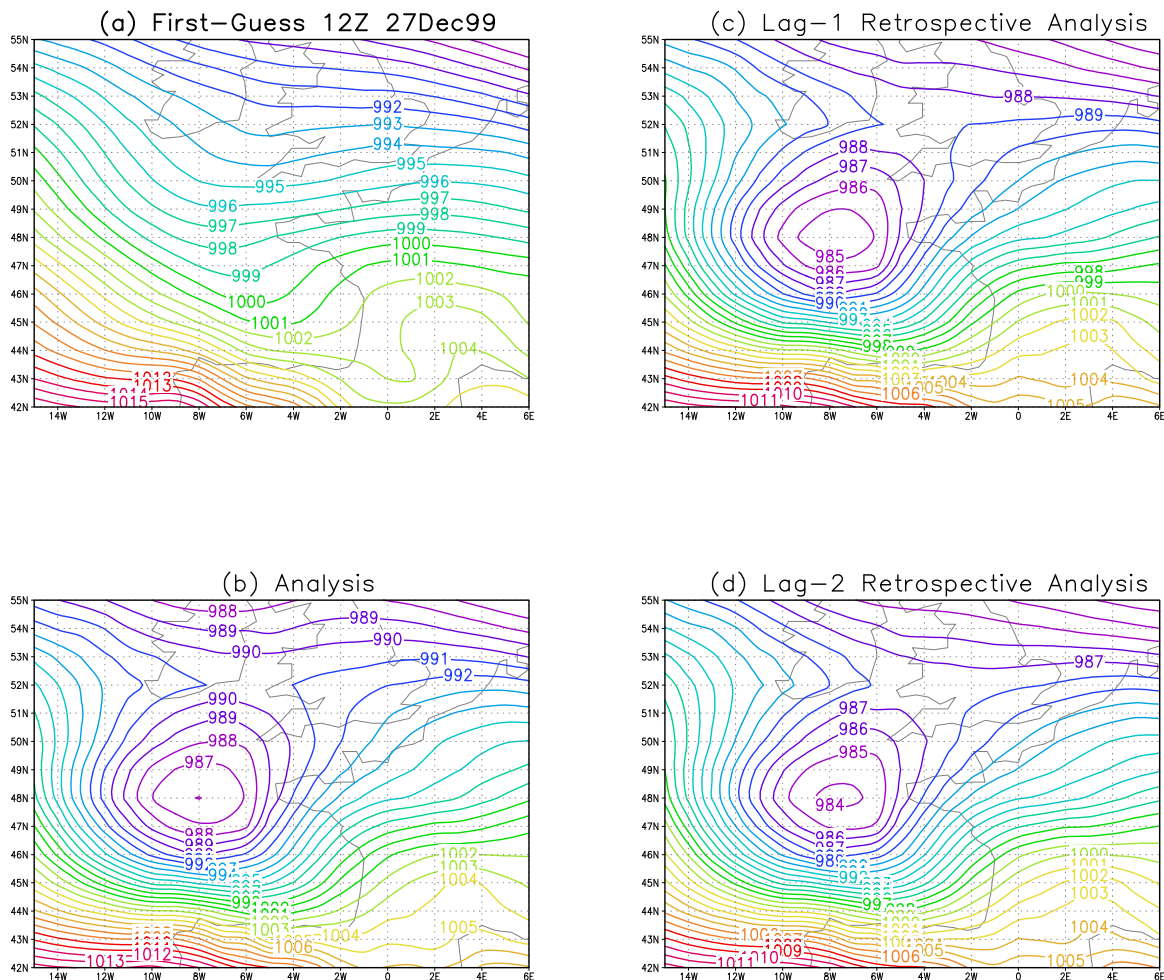# Studies with the DAO Retrospective Analysis System [*]

RICARDO TODLING AND YANQIU ZHU
Data Assimilation Office, NASA/GSFC/GSC, Greenbelt, MD, USA

For the past few years the Data Assimilation Office has been developing a Retrospective Data Analysis/Assimilation System (RDAS). The RDAS is aimed at improving analyses generated by the GEOSDAS Terra system by making use of observations ahead of the analysis time. The procedure is based on a formulation of the fixed-lag Kalman smoother.

In this presentation we will discuss the performance of applying the retrospective analysis to the French storms of December 1999. A preliminary result with the RDAS is displayed here.

[*]Corresponding author address: Dr. Ricardo Todling, Data Assimilation Office, NASA/GSFC, Code 910.3, Greenbelt, MD 20771. *e-mail:* todling@dao.gsfc.nasa.gov.

The figure shows sea level pressure at 1 mb contour intervals on 12Z 27 December 1999 (6 hours before the peak of the storm). Panels (a) and (b) on the left correspond to the background and analysis, respectively, as calculated by a slightly upgraded version of the DAO operational system. Panels (c) and (d) on the right correspond to results from the RDAS using data 6 and 12 hours ahead of 12Z, i.e., lag-1 is produced using observations from the time of the storm's peak 18Z, and lag-2 is produced using observations from 18Z and 0Z of the following day, respectively. An after the fact evaluation indicated that the DAS analysis [panel (b)] overestimates the center of the low pressure system by almost 9 mb; the lag-2 RDAS analysis shows an improved low pressure system. This improvement is partly caused by the presence of the adjoint of the tangent linear model of the Terra GCM used to propagate observation information back in time in the RDAS procedure.

Results for other similar storms from that period, and the performance of forecasts issued from either analysis or retrospective analysis, will also be presented.