# Boulder Fluid Dynamics Seminar Series

Tuesday, November 12, 2013
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado at Boulder

## Using adjoint sensitivities to constrain and exploit source-receptor relationships in air quality models

Daven Henze, *University of Colorado at Boulder*

Adjoint models provide a unique means of characterizing the relationship between distributions of atmospheric pollutants and their sources. This talk will present the value of such calculations for inverse modeling and source attribution. Constituents such as aerosols, nitrogen oxides (NOx) and ozone (O3) contribute to degraded environmental conditions throughout many regions of the world. These same species also play important roles in climate change, as their radiative impacts are large enough to either significantly offset or enhance warming caused by carbon dioxide emissions since the preindustrial era. A key factor in developing effective mitigation policies to address these issues is to improve our understanding of the relationship between emissions, the resulting distribution of pollutants in the atmosphere, and subsequent impacts on environmental endpoints. To start with, adjoint modeling is presented in the context of inverse modeling, wherein observations are used to constrain estimates of aerosol (dust, black carbon) and aerosol precursor (NH3) emissions. Next, the application of global and regional adjoint models for source attribution studies is presented. Case studies highlight the benefits of this approach for assessing long-range transport of ozone and the efficiency of aerosol source impacts on radiative forcing and mortality.

## The Seasonality of the Loop Current

Bob Leben, *Colorado Center for Astrodynamics Research*

Observational records spanning the past 35 years are reanalyzed to identify Loop Current intrusion events leading to eddy separation. Satellite observations, including satellite altimetry, ocean color, and sea surface temperature, facilitate this reanalysis and allow nearly continuous monitoring of Loop Current intrusion and eddy separation from the late 1970s onward. In contrast to earlier published records, there is a pronounced variation in the frequency of eddy separation as a function of season even in the time period before continuous altimetric sampling became available over 20 years ago. Empirical orthogonal function analyses of the altimetric record are used to identify the dominant forcing mechanism of the annual variability in the Loop Current intrusion and eddy separation.