NORTH ATLANTIC AEROSOL PROPERTIES FOR RADIATIVE IMPACT ASSESSMENTS, 
DERIVED FROM COLUMN CLOSURE ANALYSES IN TARFOX AND ACE 2

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Aerosol effects on atmospheric radiative fluxes provide a forcing function that can change the 
climate in potentially significant ways. This aerosol radiative forcing is a major source of 
uncertainty in understanding the climate change of the past century and predicting future climate. 
To help reduce this uncertainty, the 1996 Tropospheric Aerosol Radiative Forcing Observational 
Experiment (TARFOX) and the 1997 Aerosol Characterization Experiment (ACE-2) measured the 
properties and radiative effects of aerosols over the Atlantic Ocean. Both experiments used remote 
and in situ measurements from aircraft and the surface, coordinated with overpasses by a variety of 
satellite radiometers. TARFOX focused on the urban-industrial haze plume flowing from the 
United States over the western Atlantic, whereas ACE-2 studied aerosols over the eastern Atlantic 
from both Europe and Africa. These aerosols often have a marked impact on satellite-measured 
radiances. However, accurate derivation of flux changes, or radiative forcing, from the satellite-
measured radiances or retrieved aerosol optical depths (AODs) remains a difficult challenge. Here 
we summarize key initial results from TARFOX and ACE-2, with a focus on closure analyses that 
yield aerosol microphysical models for use in improved assessments of flux changes. We show 
how one such model gives computed radiative flux sensitivities (dF/dAOD) that agree with values 
measured in TARFOX and preliminary values computed for the polluted marine boundary layer in 
ACE-2. A companion paper (Bergstrom and Russell, this conference) uses the model to compute 
aerosol-induced flux changes over the North Atlantic from AVHRR-derived AOD fields.