



**NCAR** National Center for  
Atmospheric Research

University Corporation for Atmospheric Research

1998-33

**FOR IMMEDIATE RELEASE:** December 2, 1998

## Ozone above Indian Ocean Linked to African Lightning

BOULDER -- In one of the first studies to trace lightning's chemical impact across thousands of miles, a team of atmospheric chemists has connected a region of elevated ozone levels in the eastern Indian Ocean with lightning produced in Africa. The results will be presented December 6 at the American Geophysical Union conference in San Francisco by Louisa Emmons, a visiting scientist at the National Center for Atmospheric Research (NCAR). NCAR's primary sponsor is the National Science Foundation.

### Contact:

David Hosansky  
UCAR Communications  
P.O. Box 3000  
Boulder, CO 80307-3000  
Telephone: (303) 497-8611  
Fax: (303) 497-8610  
E-mail: [hosansky@ucar.edu](mailto:hosansky@ucar.edu)

Emmons and colleagues examined a set of ozone data collected over four years between Japan and Antarctica for their paper, "Evidence of Transport Across the Indian Ocean of Ozone Produced from Biomass Burning and Lightning" (AGU paper A12D-11). Her coauthors are Didier Hauglustaine (France's Centre National de la Recherche Scientifique), Michael Newchurch (University of Alabama at Huntsville), Toshi Takao and Kouji Matsubara (Japan Meteorological Agency), and Guy Brasseur (NCAR). The research was funded by the National Aeronautics and Space Administration.

Lightning is known to produce nitrogen oxides (NO<sub>x</sub>) within thunderstorms. These chemicals may react with others in the presence of sunlight to produce ozone. Until now, most related studies have focused on measuring the production of NO<sub>x</sub> in the immediate vicinity of storms. However, the ozone produced has a long lifetime in the upper troposphere and thus could be carried over long distances. According to Emmons and colleagues, ozone from storms across southern Africa is being transported by the subtropical jet stream to Australia.

Ozone measurements between 2 and 6 miles in altitude (3-10 kilometers) over a large part of the eastern Indian Ocean were as high as 80 parts per billion, similar to a polluted day in a U.S. city and several times more than normal levels, says Emmons. To analyze the source of this ozone, she and colleagues used a new computer model of atmospheric chemistry called MOZART, developed at NCAR by Brasseur and Hauglustaine.

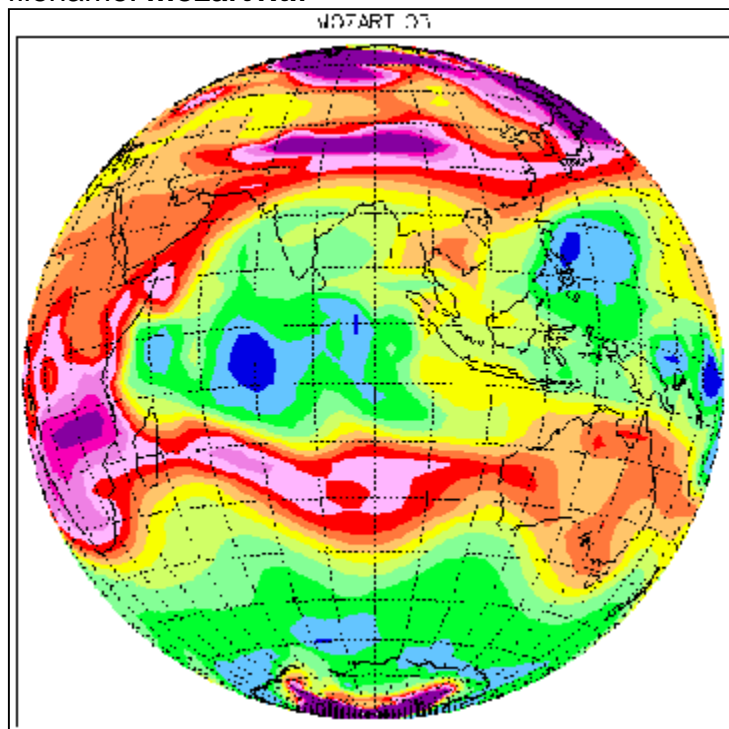
Results from MOZART indicate that the ozone did not descend from the stratosphere, the

most obvious source. Another possible source was the burning of forests and grasses upwind in Africa. When biomass burning was removed from the model calculations, ozone levels remained high, but when African lightning was removed, the ozone levels dropped significantly. The MOZART results are consistent with the observations above.

"Although there are uncertainties in the model results," says Emmons, "they indicate that lightning has a far-reaching and significant impact on tropospheric chemistry."

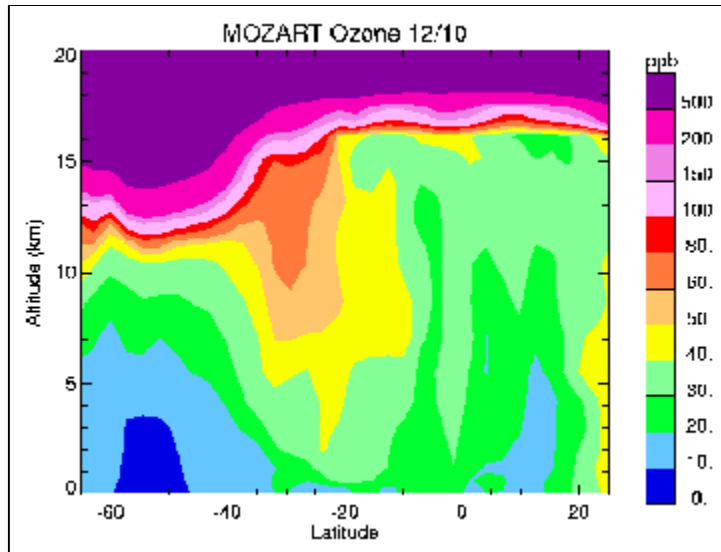
The University Corporation for Atmospheric Research, a consortium of more than 60 universities offering Ph.D.s in atmospheric and related sciences, manages NCAR.

filename: **mozart1.tif**



Ozone levels from a standard run of MOZART, including biomass burning and lightning emissions, in parts per billion (ppb) on a single day at the altitude of 300 millibars (about 6 miles). Highest ozone levels (purple) are over Africa, where the ozone is being produced, but high values extend across the Indian Ocean to Australia.

filename: **mozart2.tif**



Ozone levels from a standard run of MOZART, including biomass burning and lightning emissions, in parts per billion (ppb) on a single day along a vertical cross section (N-S) at longitude 100 degrees E. The area of enhanced ozone between 20 and 30 degrees S latitude and 3 to 10 kilometers altitude is believed to be related to African lightning. Fi

-The End-

**Writer:** Bob Henson

**To receive UCAR and NCAR press releases by e-mail,  
contact Milli Butterworth  
telephone 303-497-8601 or by email [butterwo@ucar.edu](mailto:butterwo@ucar.edu)**

---

[UCAR news releases](#)  
[UCAR news in brief](#)

[UCAR](#)  
[NCAR](#)  
[UOP](#)

---

The National Center for Atmospheric Research and UCAR Office of Programs are operated by UCAR under the sponsorship of the National Science Foundation and other agencies. Opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of any of UCAR's sponsors. UCAR is an Equal Opportunity/Affirmative Action employer.

---

**Prepared for the web by Jacque Marshall**

Last revised: Fri Apr 7 15:38:50 MDT 2000  
Last revised: Wed Dec 2 09:57:03 MST 1998