The Influence of European Pollution on Surface Ozone in the Near East and Northern Africa

Bryan Duncan

Jason West → *Health Impacts*

Yasuko Yoshida → *Model v Observations*

Arlene Fiore → *Surface Ozone*

Jerry Ziemke → *Tropospheric Column Ozone*

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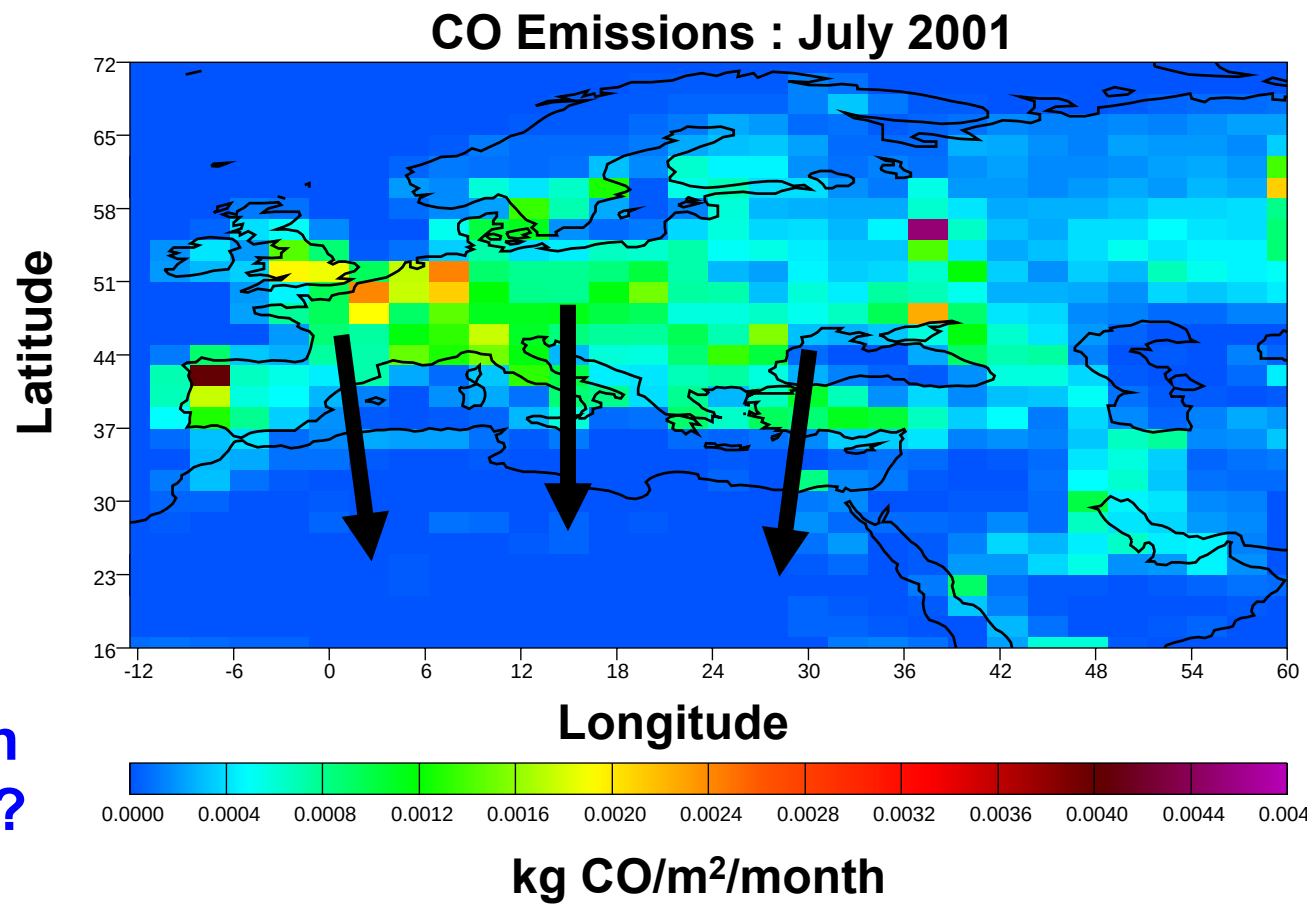
Rationale for Study

- European pollution flows southward in summer into photochemically-favorable environment.
  - Mediterranean [MINOS]
  - N. Africa & Near East [*Duncan and Bey, 2004*].

- N. Africa & Near East = 200 million people

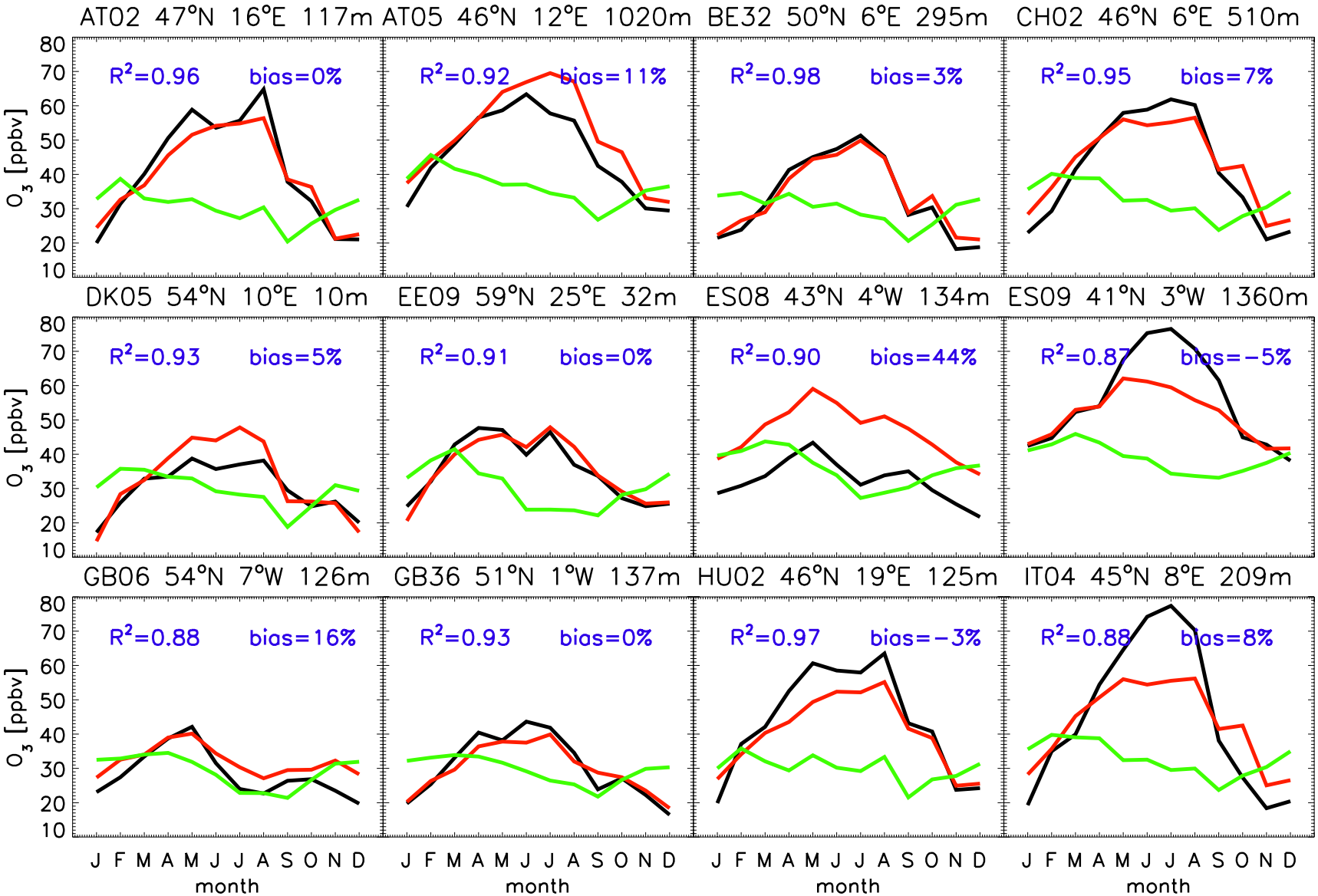
- What are the health impacts of European pollution downwind?



Monthly-average ozone (1300-1700 LT) : 2001

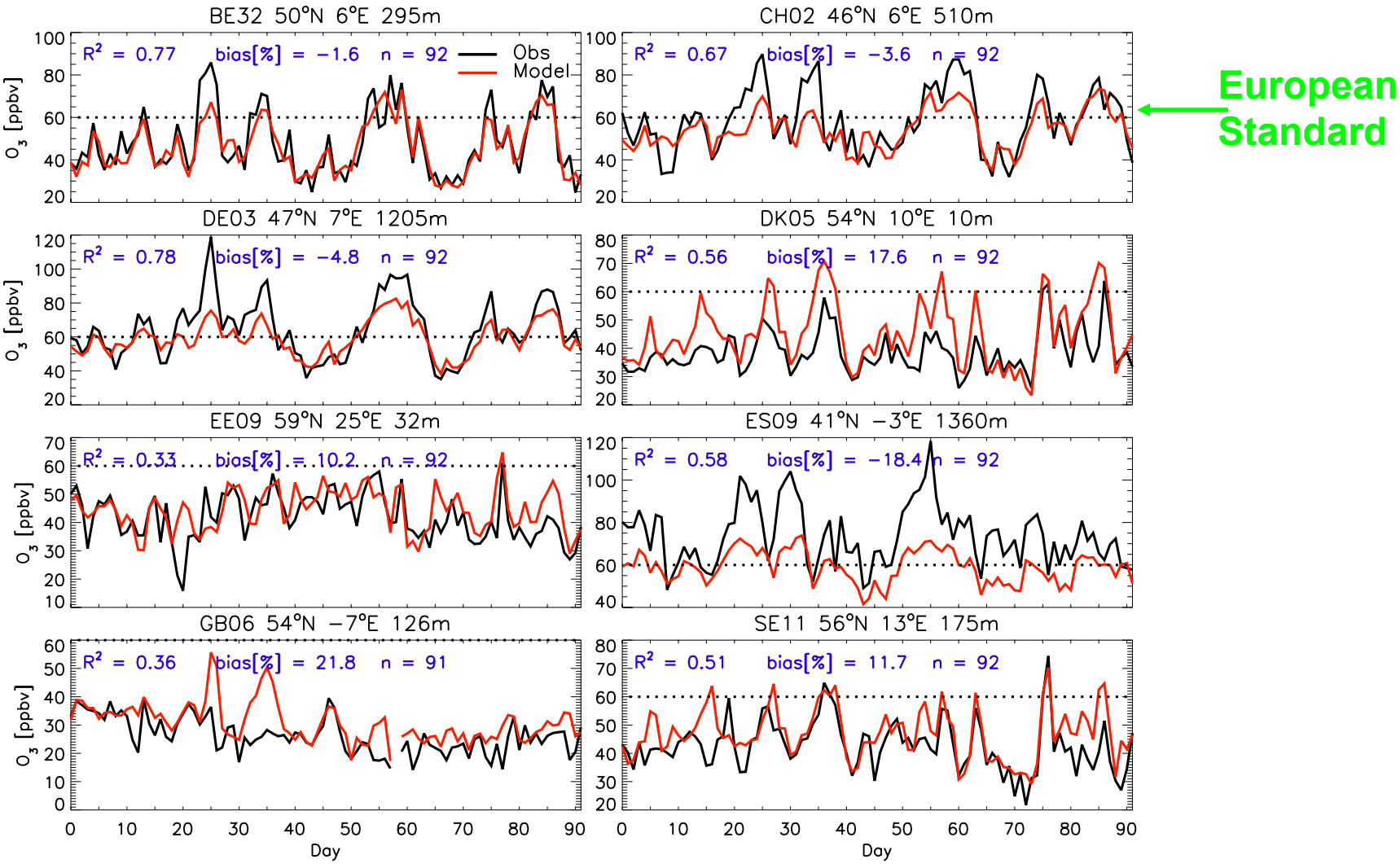
Standard Run **EMEP Observations** **"No Europe" Run**

Average of 67 stations : R^2 = 0.9 Bias = 11%



Daily max 8-hr-average ozone : June-August 2001

Standard Run **EMEP Observations**



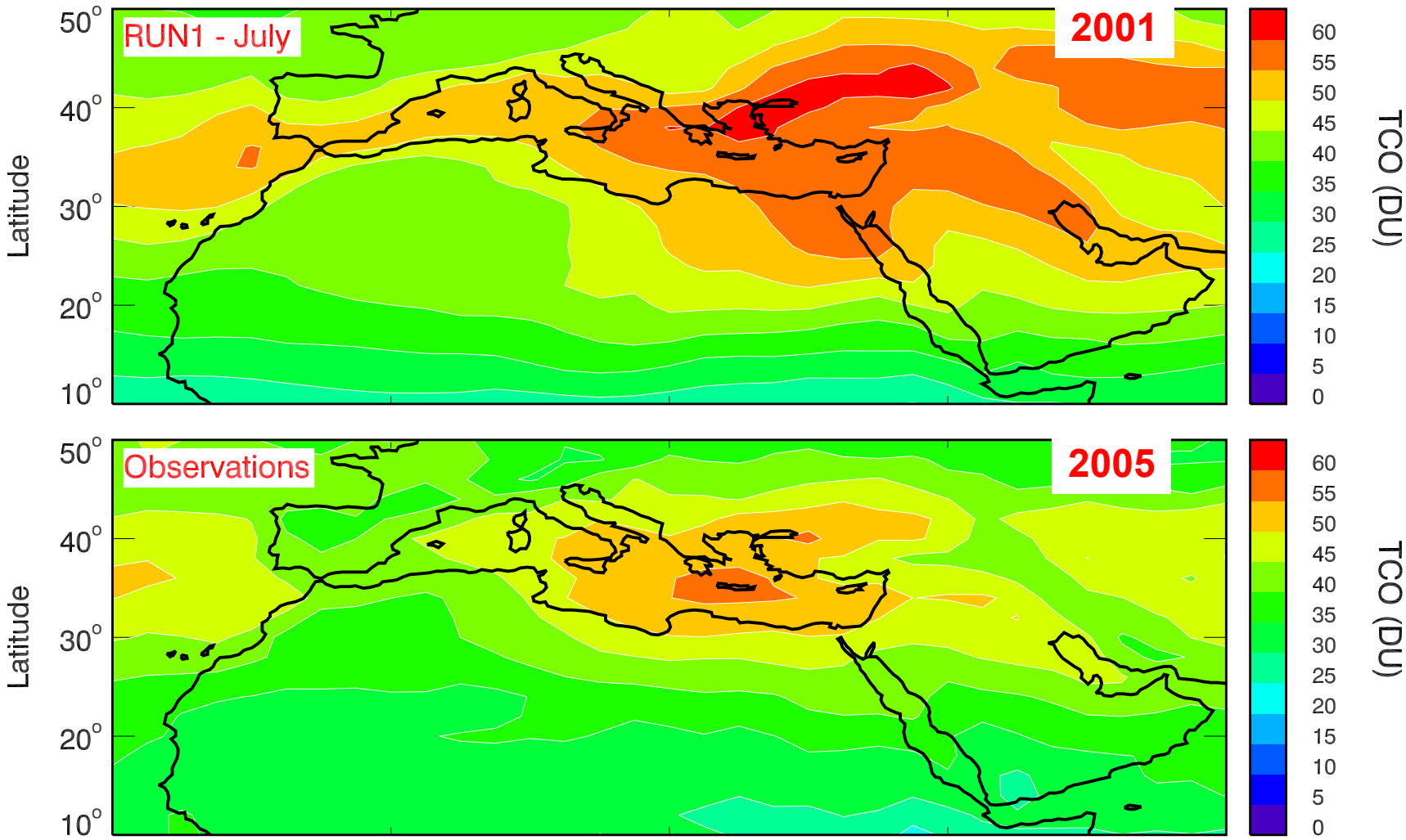
Avg 67: R^2 = 0.54
Bias = 9.5%

Captures synoptic-scale variability.

Simulates # violations fairly well.

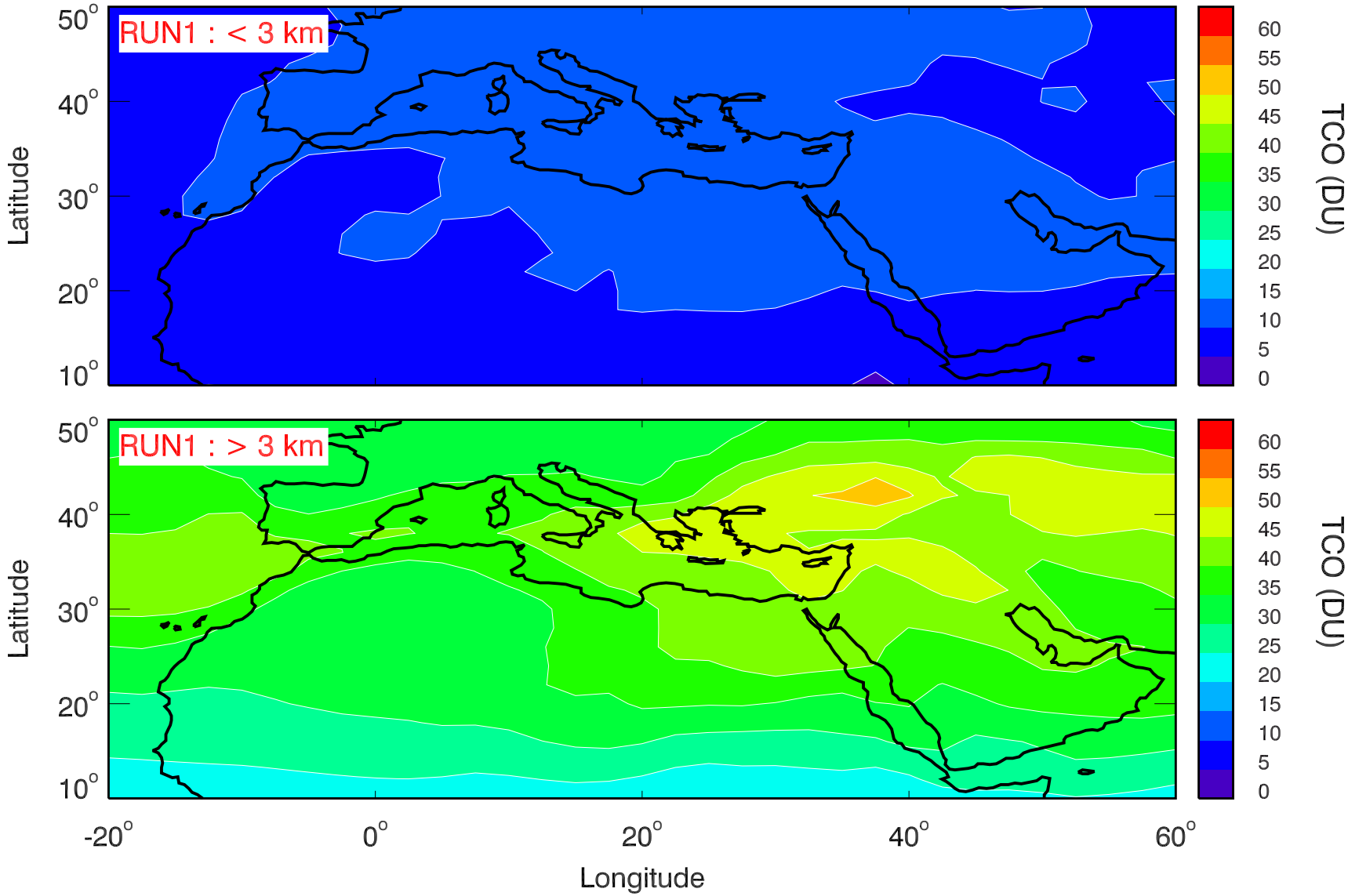
Monthly-average Tropospheric Column Ozone (DU) : July

- **Paucity of observations of surface ozone.**
- **Is the TCO indicating outflow from Europe?**



Monthly-average TCO (DU) : July

Is the TCO indicating outflow from Europe? NO!



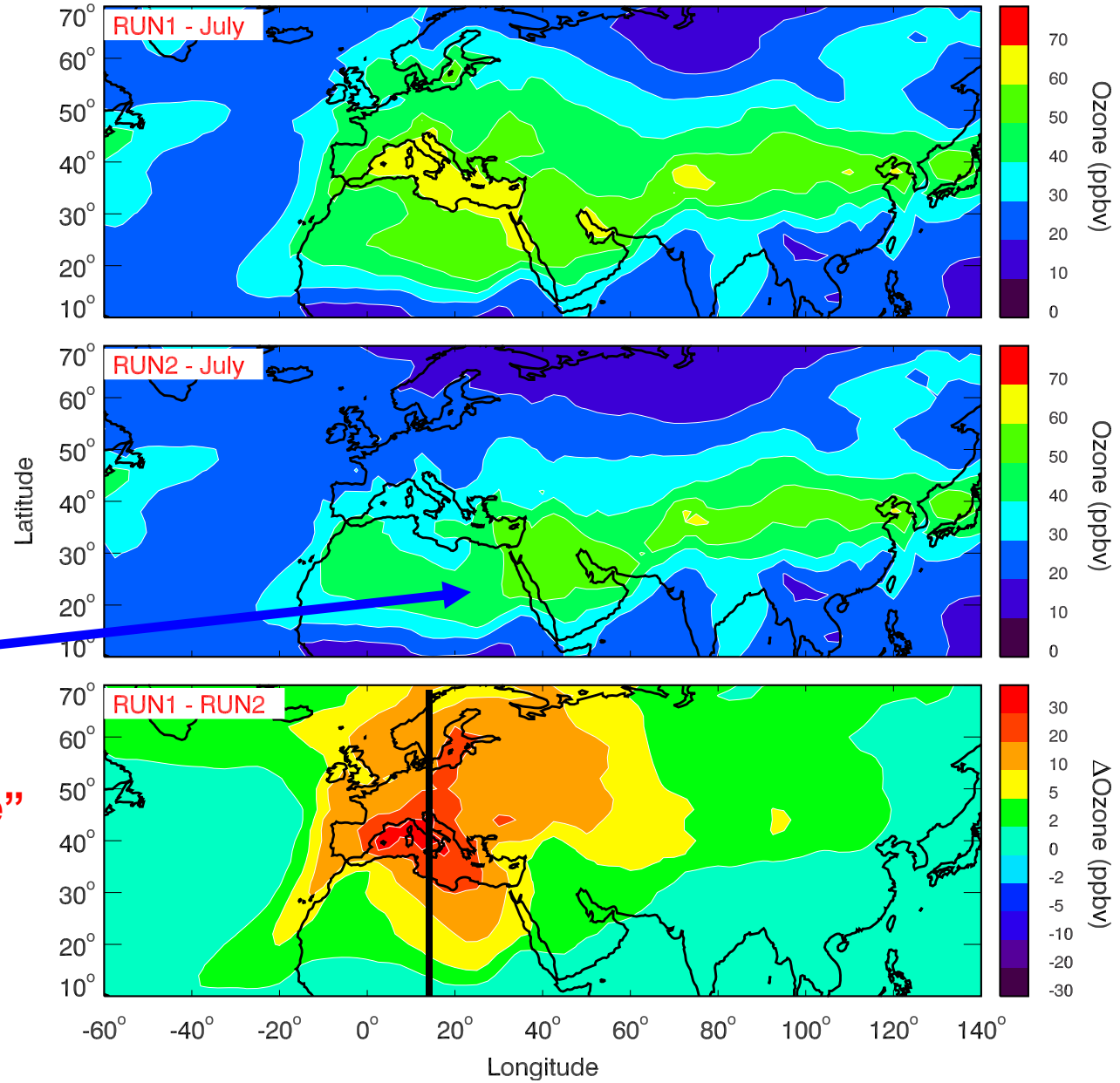
July-Average Surface Ozone (1-24 hr : ppbv)

Standard Run

"No Europe" Run

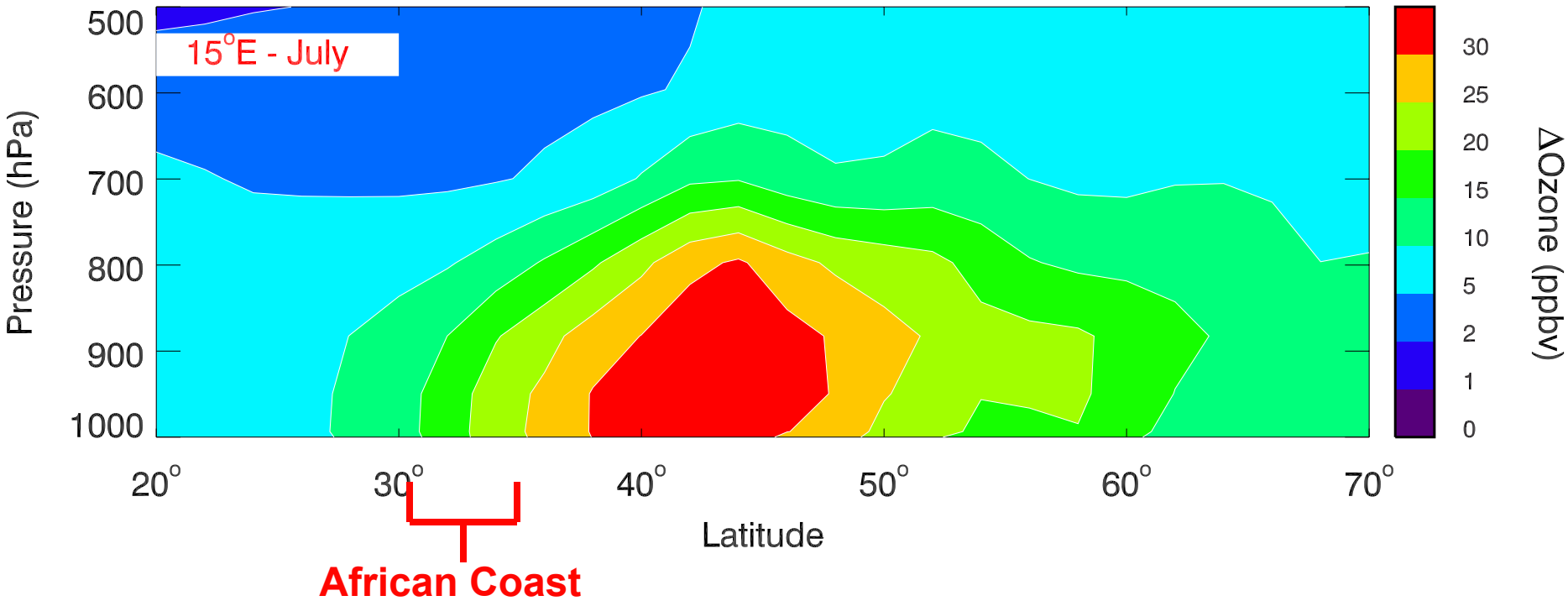
Close to Threshold of Standard!

Standard - "No Europe"



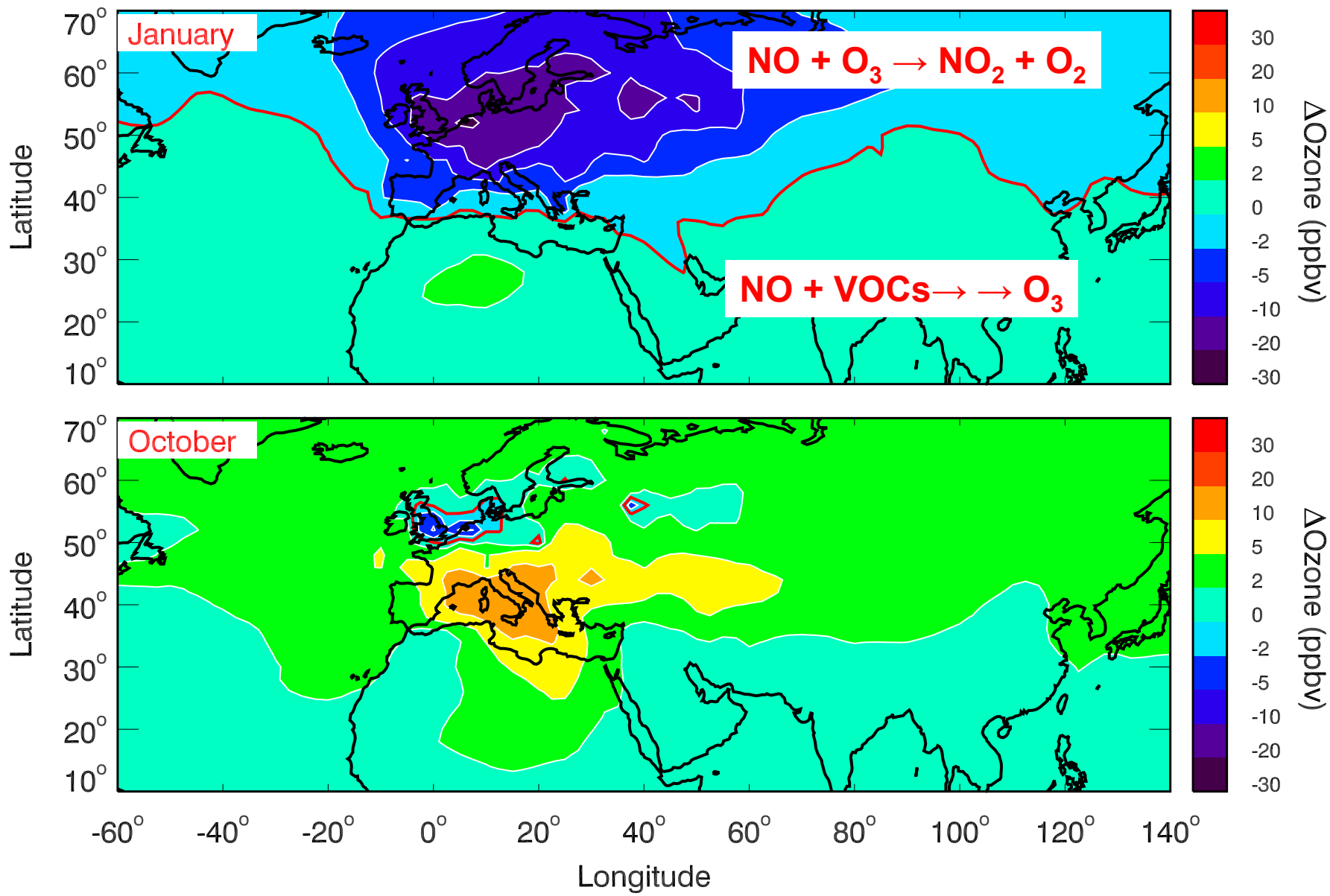
July-Average ΔOzone (1-24 hr : ppbv)
15°E Cross-Section

Standard - "No Europe"

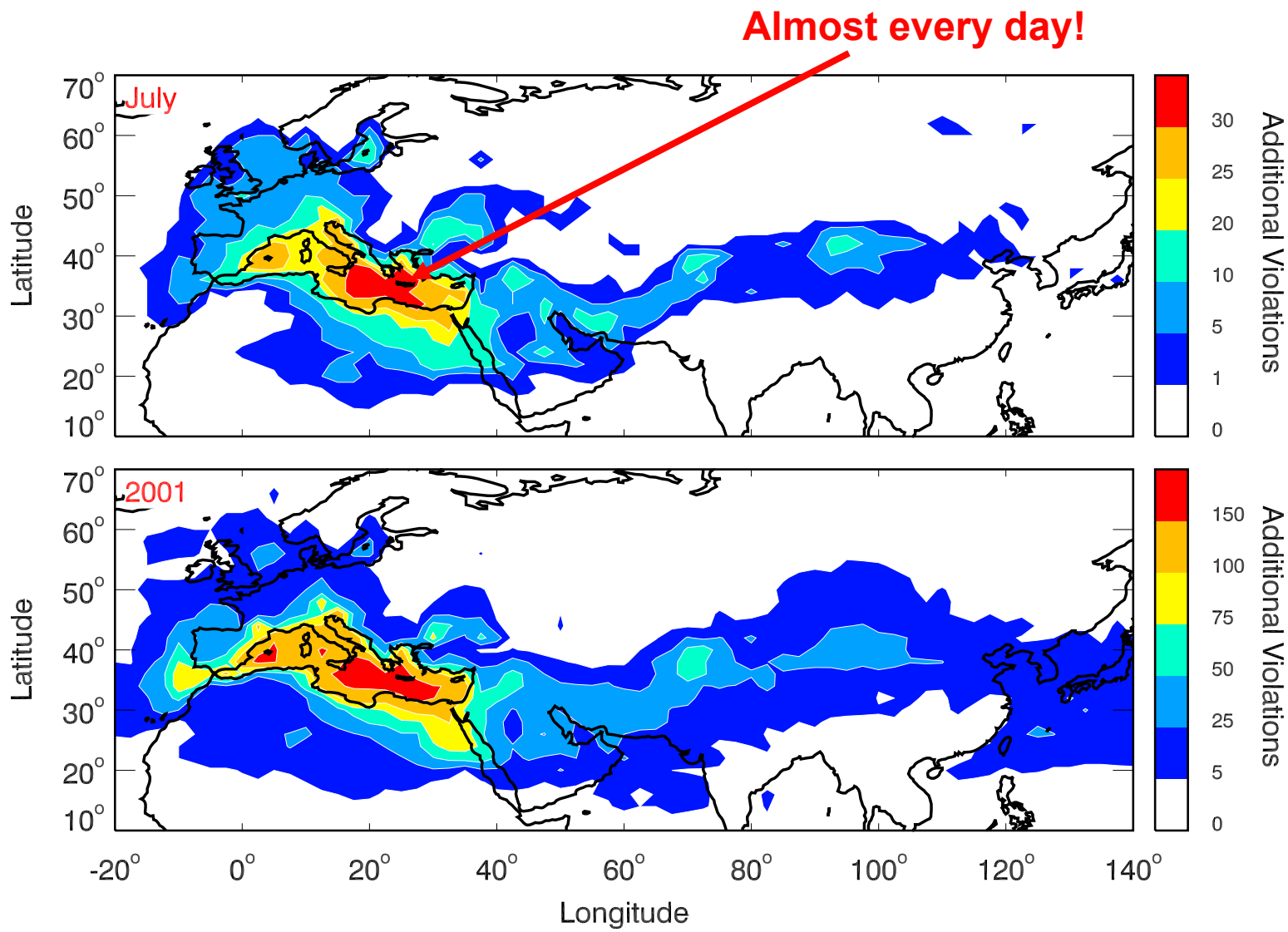


Model outflow < 3 km

Monthly-Average ΔSurface Ozone (1-24 hr : ppbv)

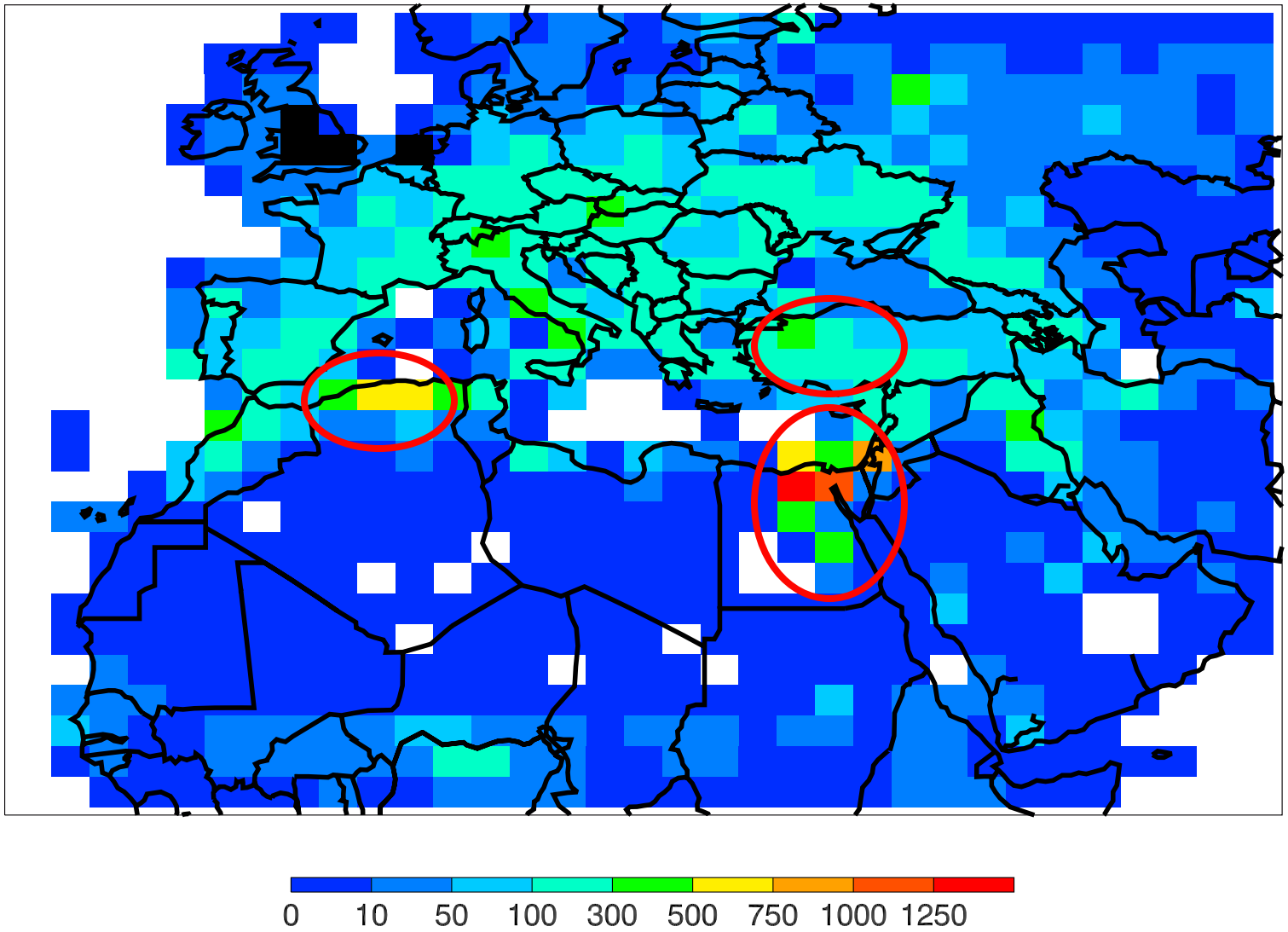


Additional Violations of European Standard for Ozone

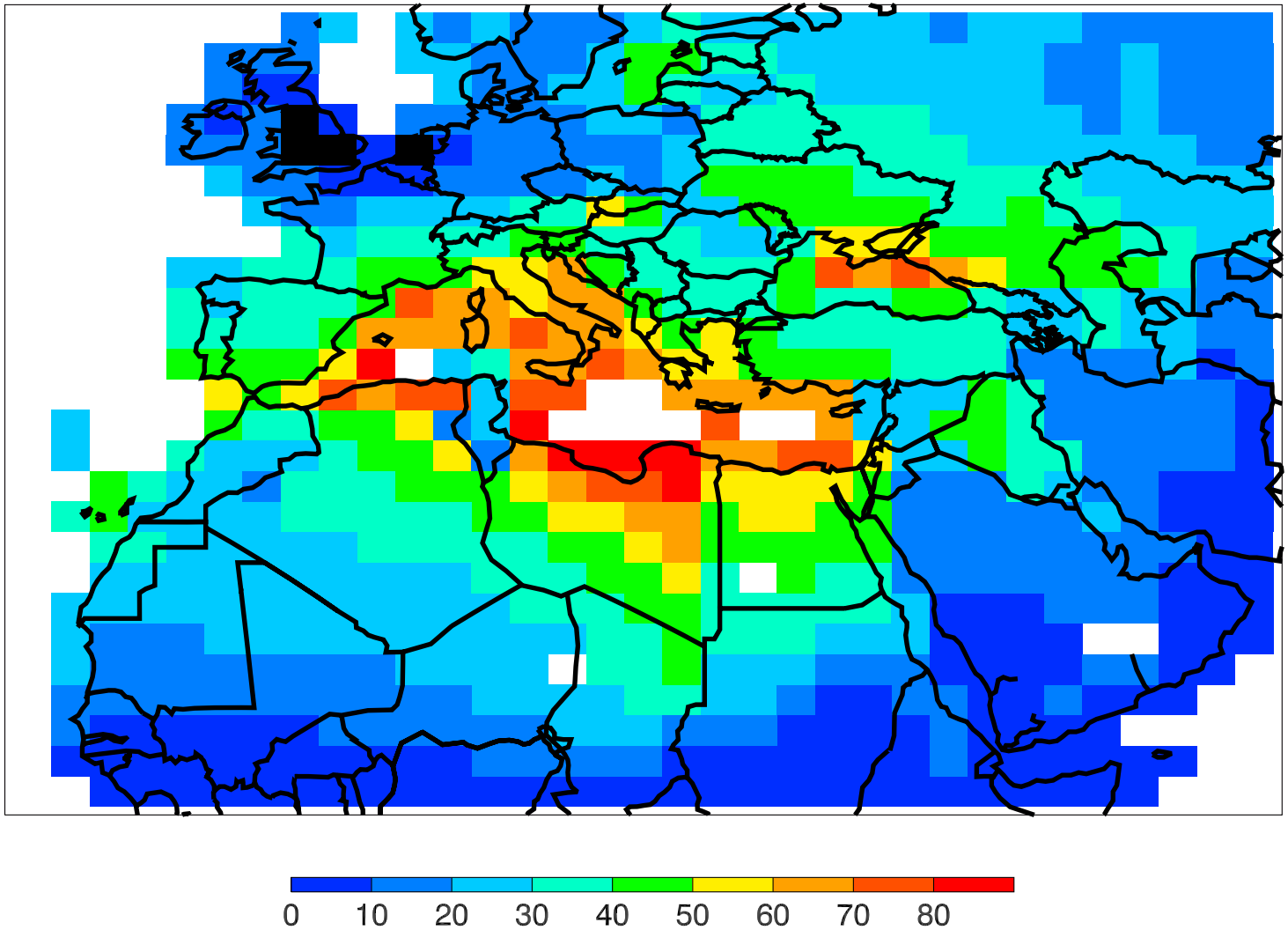


Premature Mortalities/Year

50,000 deaths/yr! **Large impact outside of Europe!**



Premature Mortalities/Million People/Year



Conclusions

- ***"European" ozone causes:***

  50-150 Additional Violations of European Health Standard in northern Africa & Near East

  50,000 Additional Deaths/yr
  19,000 in N. Africa & Near East
  9,500 in South & East Asia (due to large pop.)

- ***Air quality in northern Africa & the Near East would benefit from an international approach to managing air quality.***

Conclusions

- ***Bryan's Righteous Indignation!***

  LRTAP considers Transport from:

  N. America → Europe

  Europe → E. Asia

  E. Asia → N. America

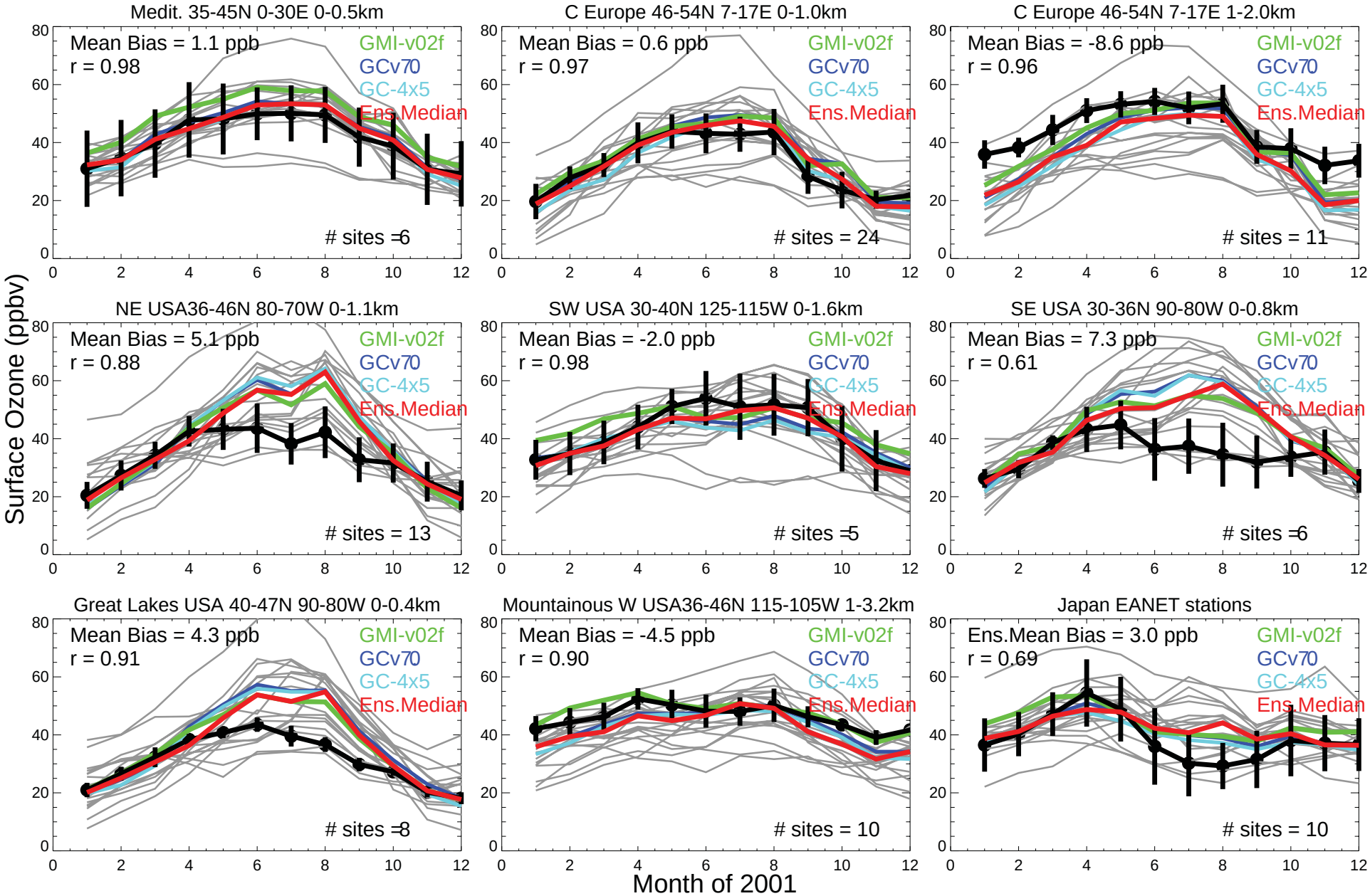
  But NOT:

  Europe → northern Africa & Near East

  So, do Europeans have the right to complain about N. American pollution impacting their air quality?

HTAP CTM/GCM Intercomparison: Surface Ozone (ppbv)

courtesy of Arlene Fiore (NOAA/GFDL)



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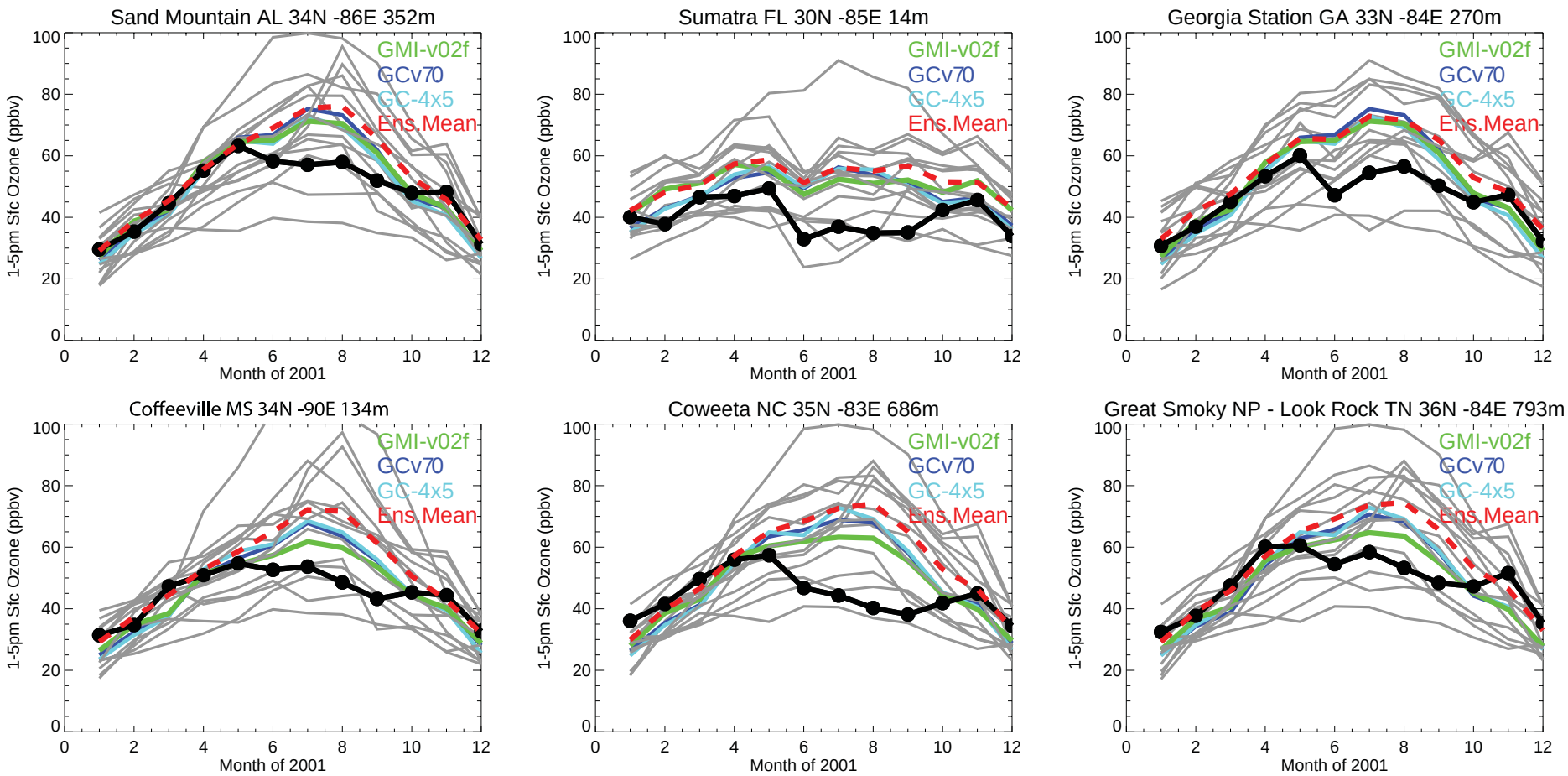
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