Is there a Summertime Middle East Ozone Maximum in the Upper Troposphere?

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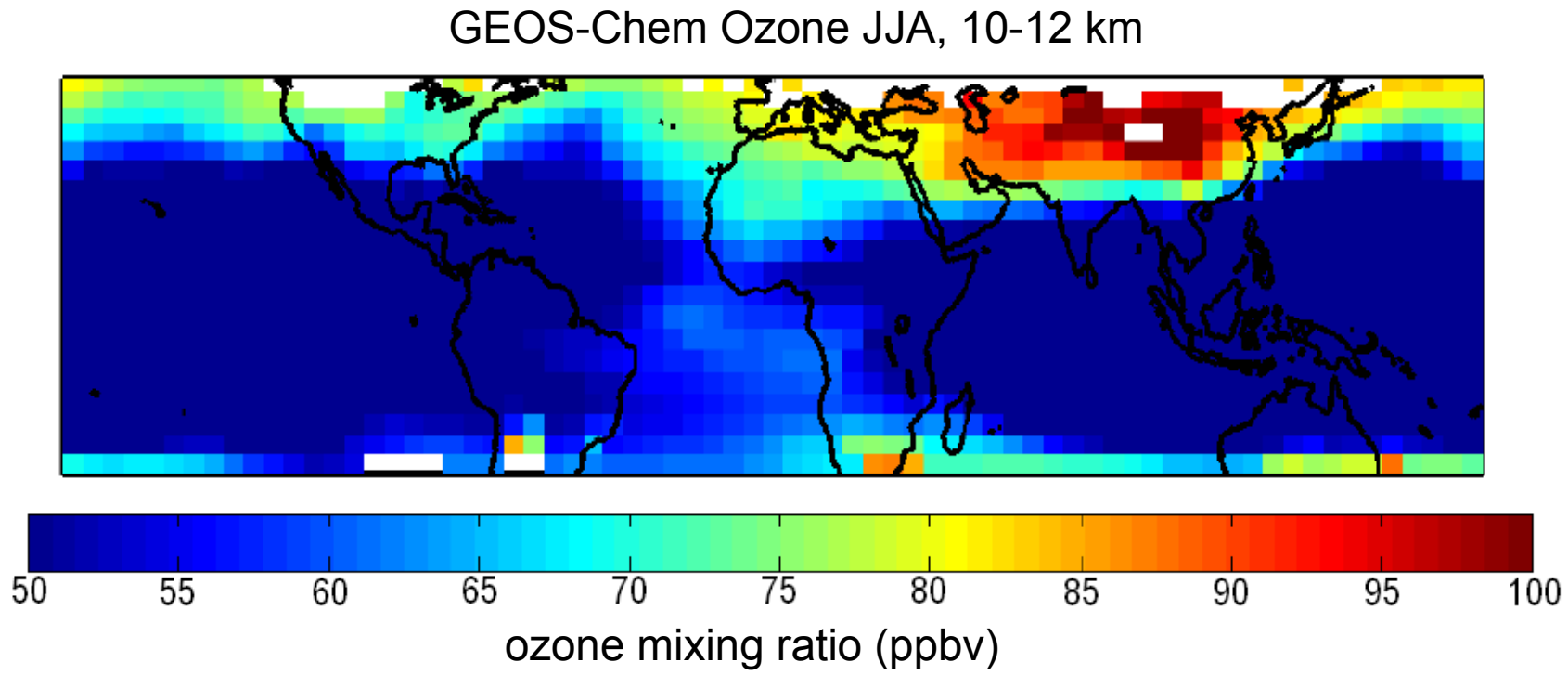
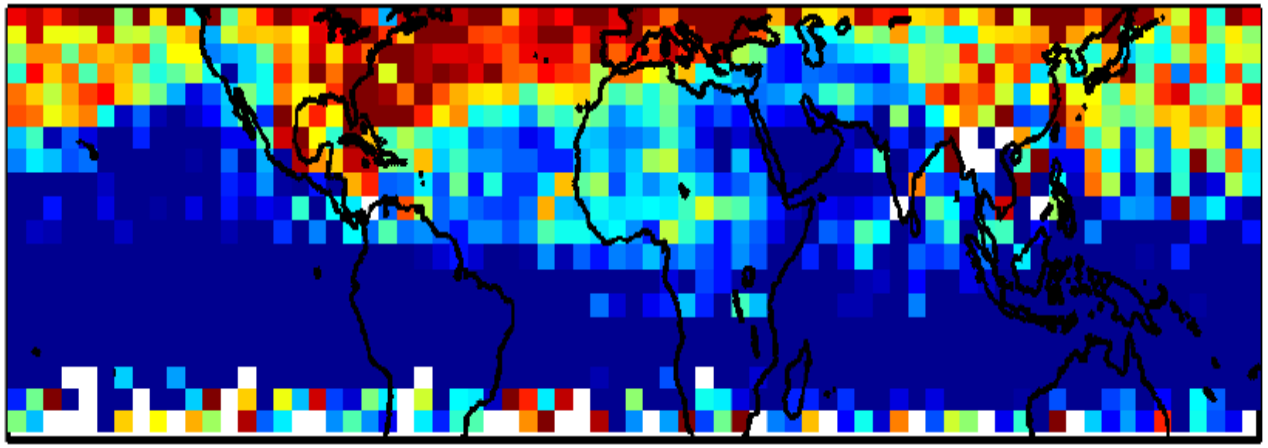
Conflicting Information Regarding Ozone Over Middle East

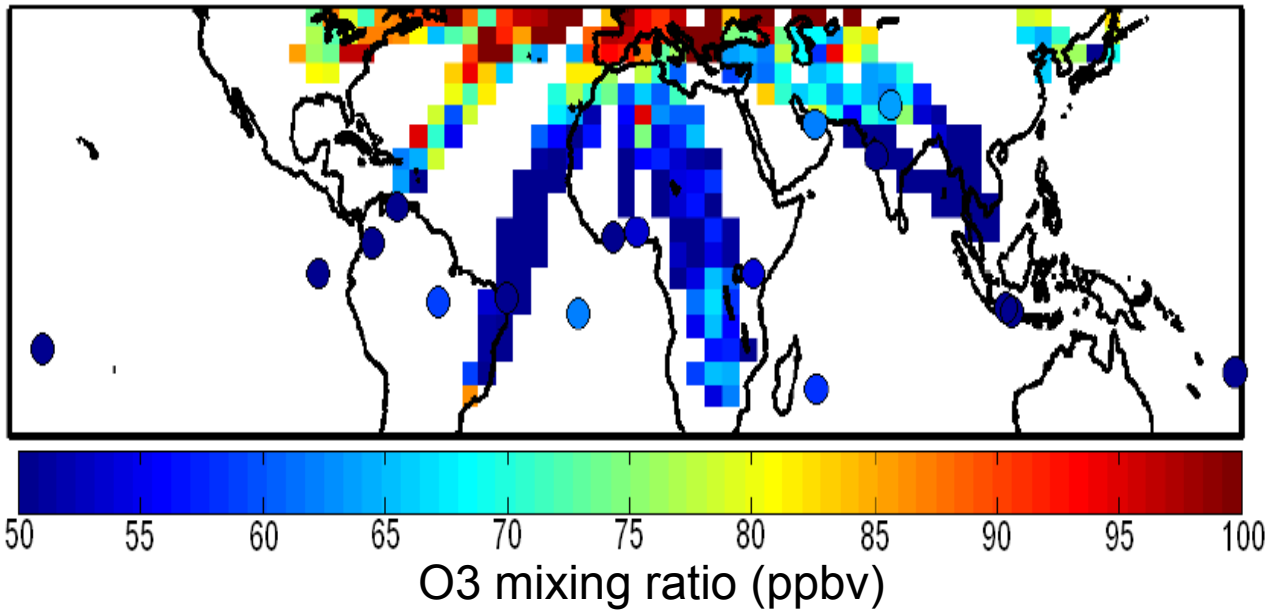


- GEOS-Chem predicts high ozone over Middle East (Li et al [GRL 2001])
- Observed by TES in middle troposphere (Liu et al [JGR 2008])
- Not apparent in GOME (Liu et al [GRL 2006])

OSIRIS (JJA 2002-2006, 10-12 km) – No Middle East Max



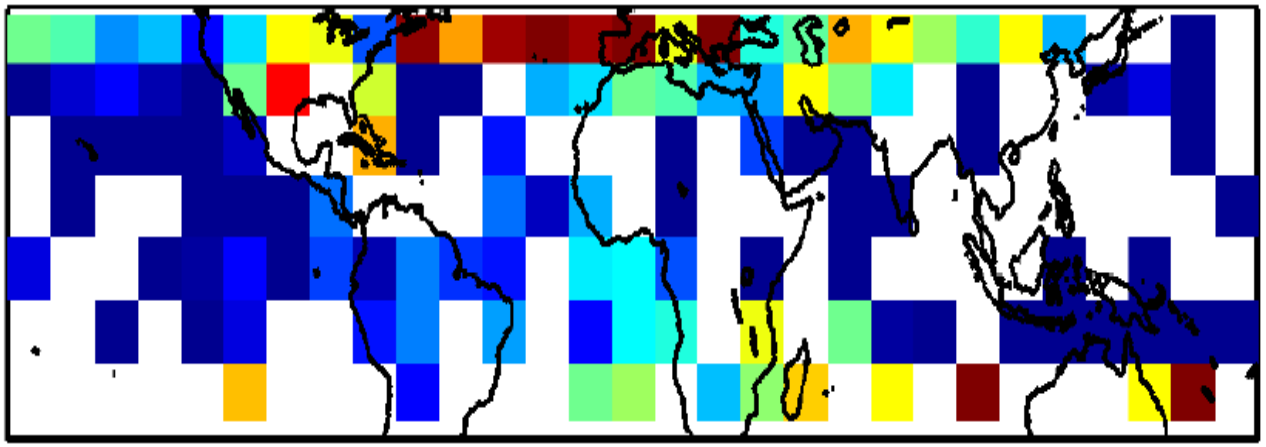
MOZAIC & Sondes (JJA 1994-2006 , 10-12 km)



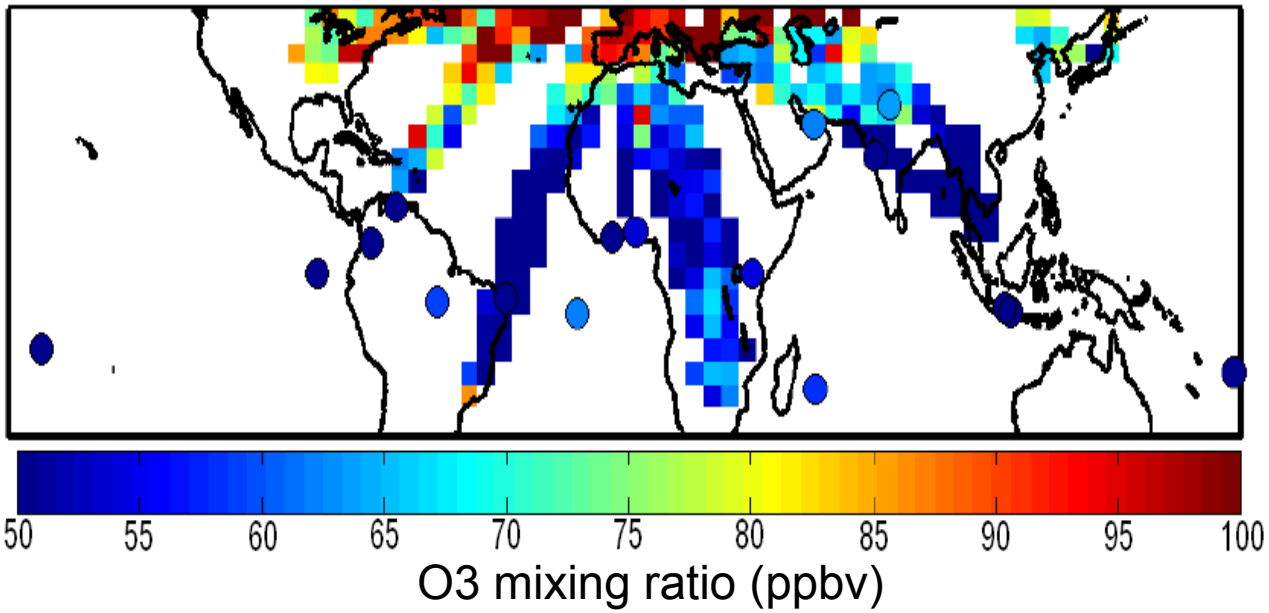
OSIRIS:

- Limb scattering instrument on Odin satellite
- Correlation with MOZAIC 0.5
- Mean bias 15%

ACE (JJA 2004-2008, 10-12 km) – No Middle East Maximum



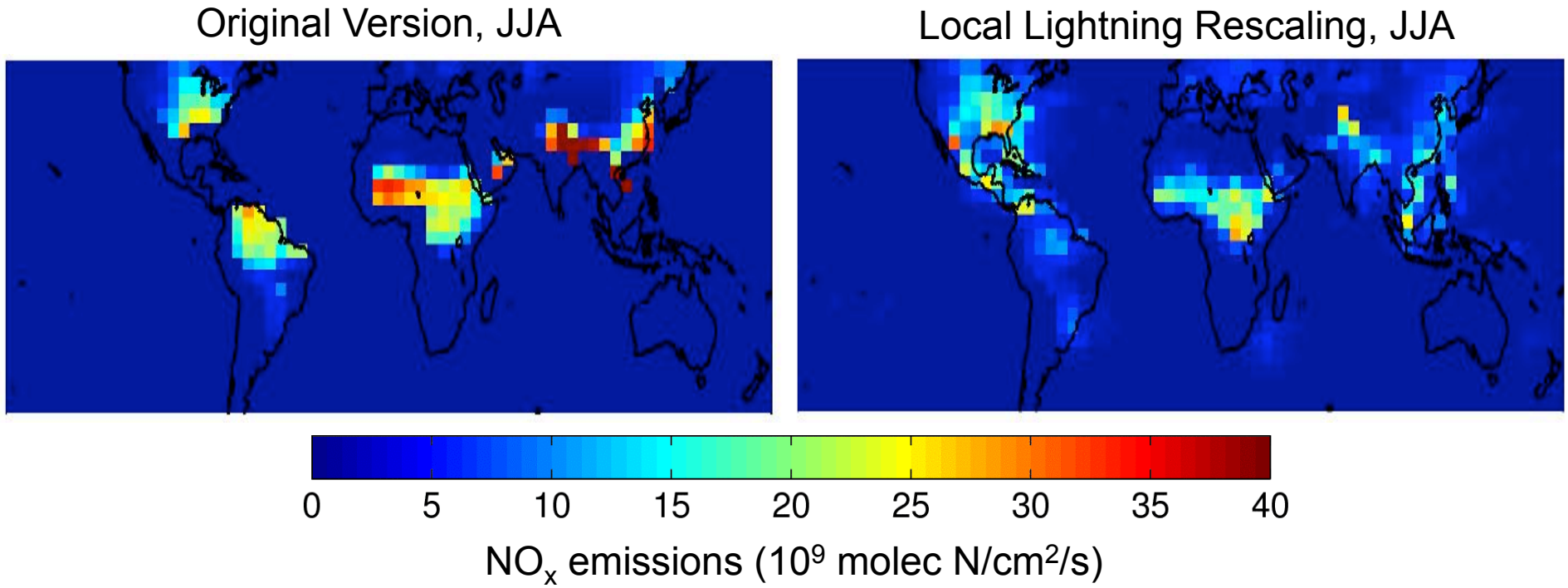
MOZAIC & Sondes (JJA 1994-2006 , 10-12 km)



ACE

- Solar occultation instrument on SCISAT-1
- Correlation 0.7
- Mean bias 10%
- Most profiles do not reach 10-12 km

Local Lightning Rescaling

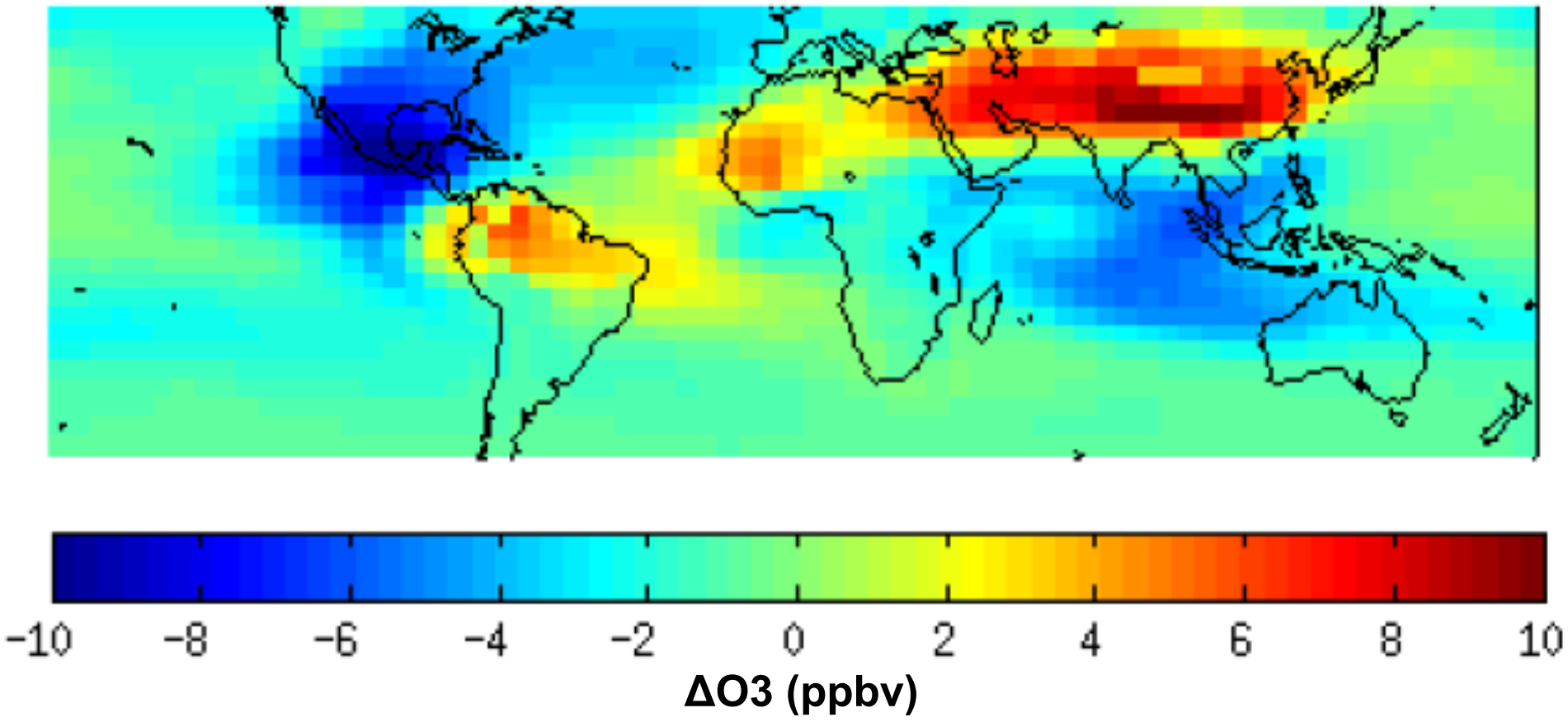


- Scale lightning emissions to observed flash rates
- Reduces emissions in Asia

[Sauvage et al, ACP 2007]

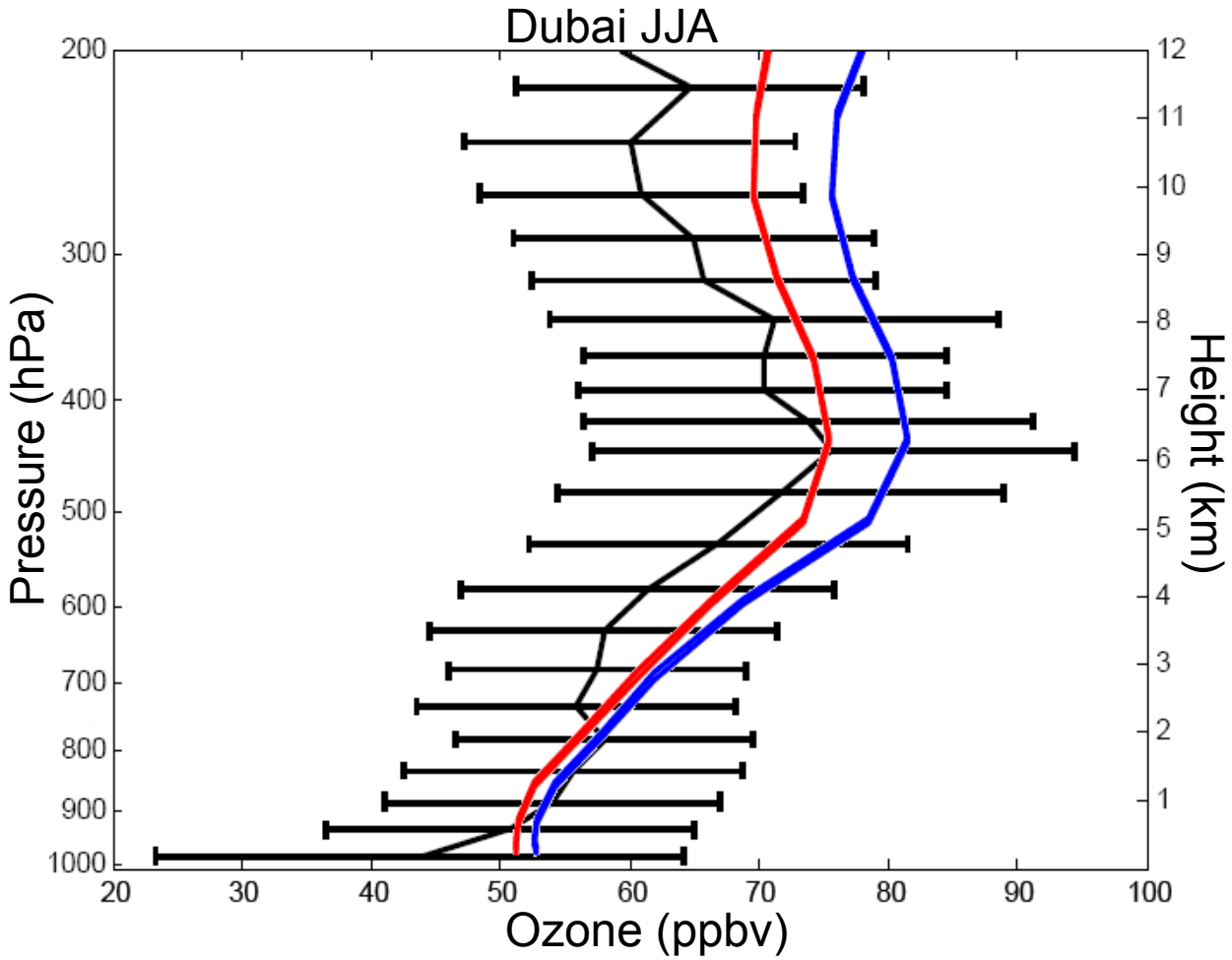
Rescaling Lightning Reduces Middle East Ozone Max

Without – With Local Lightning Rescaling, JJA 10-12km



- Region influenced by Asian pollution, monsoon
- Local Lightning Rescaling reduces NOx emissions over Asia, reduces ozone over Middle East

Rescaling Lightning Improves Agreement With Observations



GEOS-Chem

GEOS-Chem Rescaled Lightning

MOZAIC & SHADOZ

[Sauvage et al, ACP 2007]

Concluding Remarks

- Elevated ozone in original GEOS-Chem between 10-12 km is not observed by MOZAIC, OSIRIS or ACE
- Local Lightning Rescaling reduces ozone over Middle East