

Progress on a TWP-ICE Monsoon Case Study

Ann Fridlind and Andrew Ackerman • NASA GISS

thanks to

Jon Petch • ECMWF

Shaocheng Xie • LLNL

TWP-ICE and ACTIVE Science Teams

DOE ARM Program and Data Archive

NASA Radiation Sciences Program

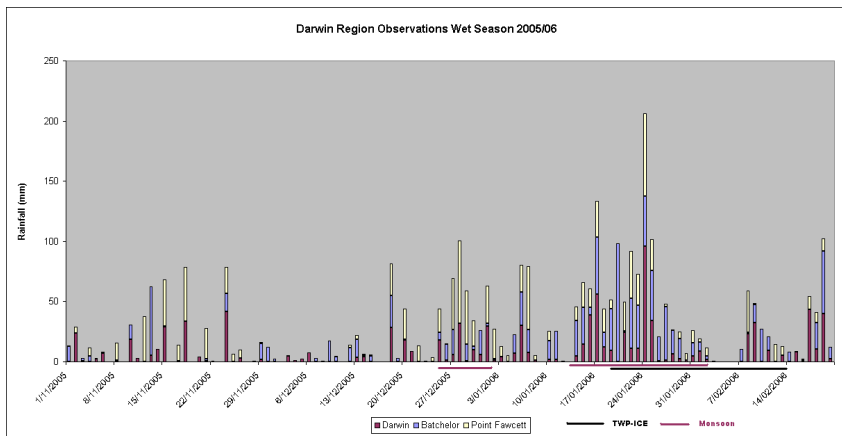
NASA Advanced Supercomputing Division

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10 March 2008

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 - TWP-ICE monsoon period
 - GISS set-up
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 - Comparison with ECMWF forcing style
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 - Tropopause moisture analysis
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Northern Australia 2005/2006 wet season



Source: Lori Chappel, Australian BOM

Case description

- idealized maritime convection (specified SST)

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- compare results with in situ, ground-based, and satellite data
- 18–24 January (6 days), possible extension through 2 February

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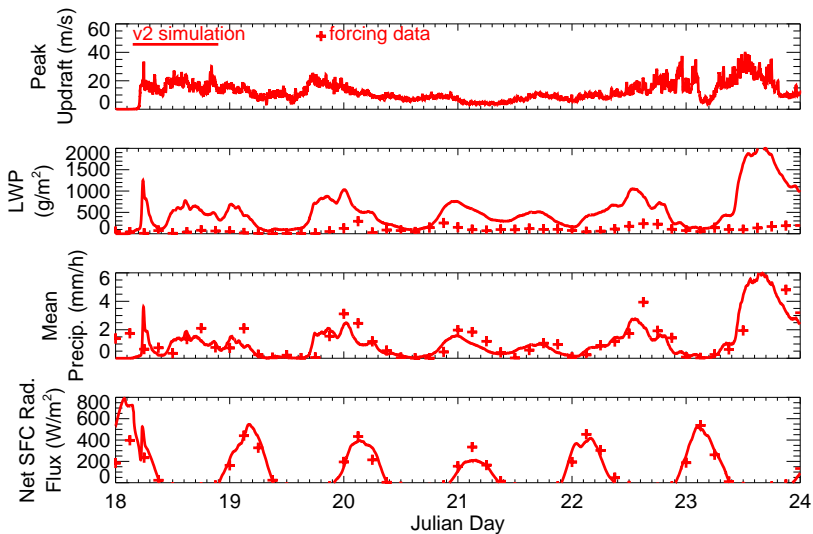
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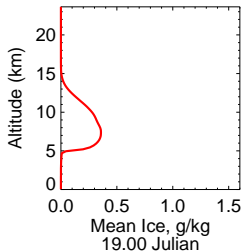
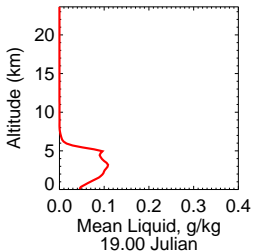
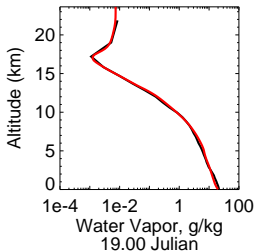
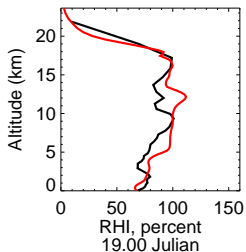
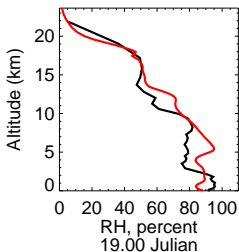
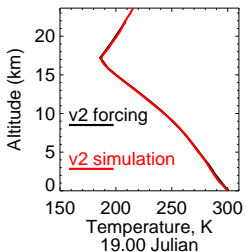
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- 100-m to 250-m resolution below 18.5 km

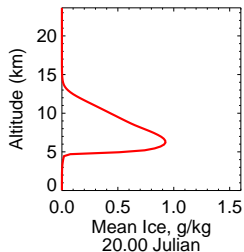
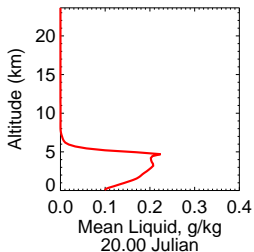
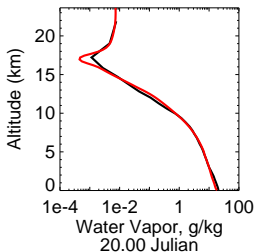
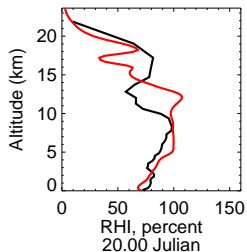
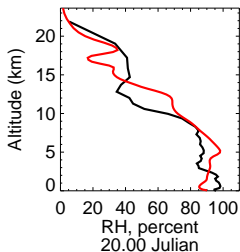
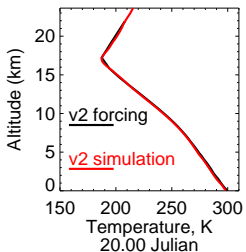
Time series



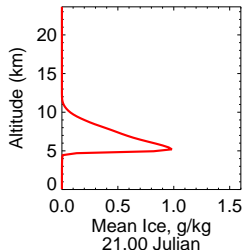
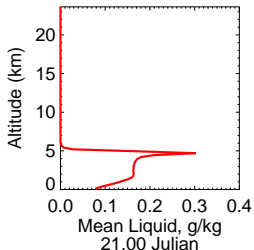
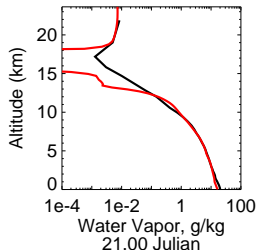
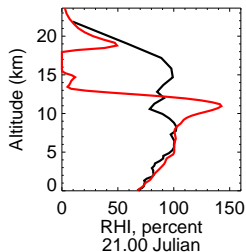
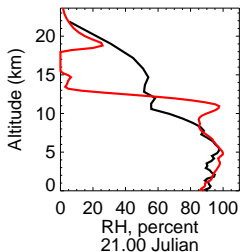
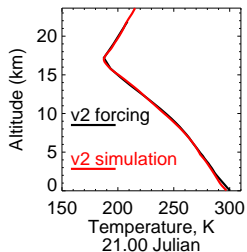
Profile evolution



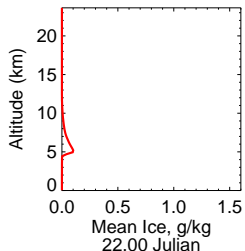
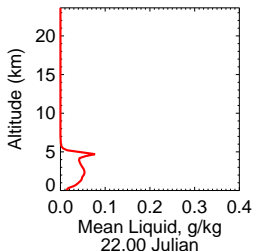
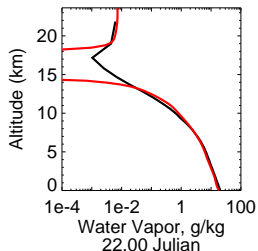
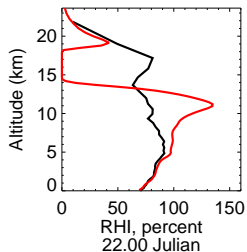
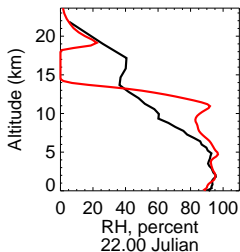
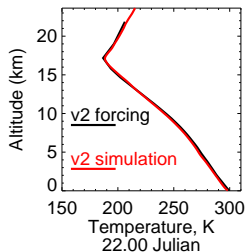
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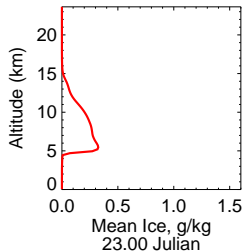
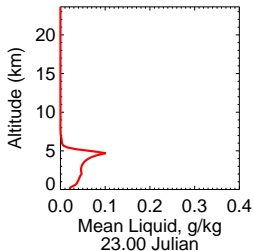
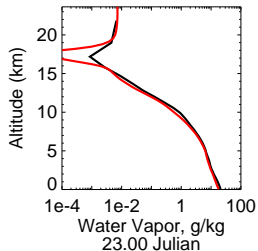
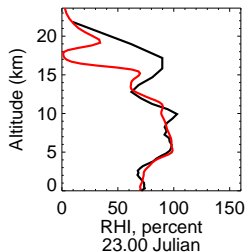
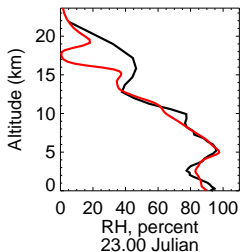
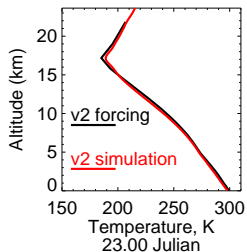
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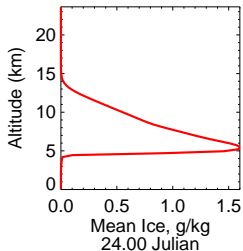
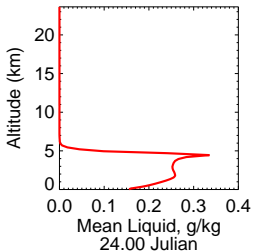
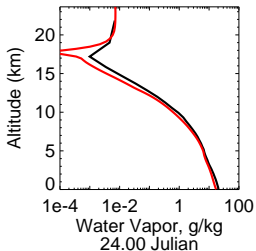
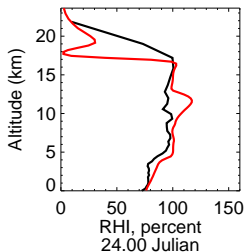
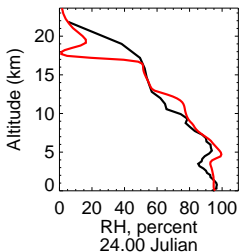
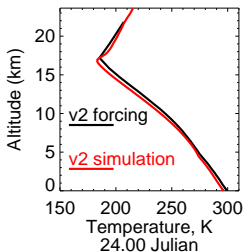
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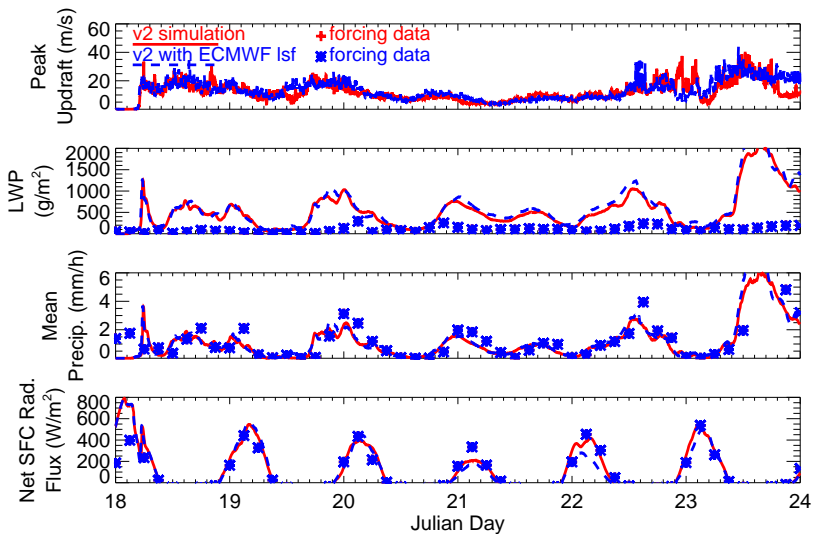
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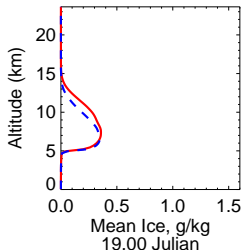
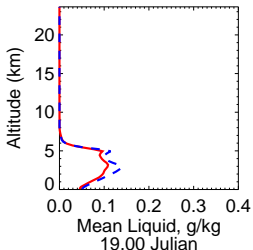
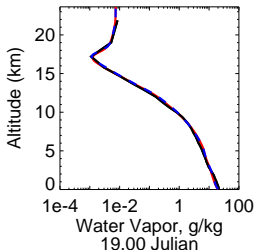
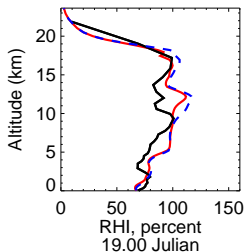
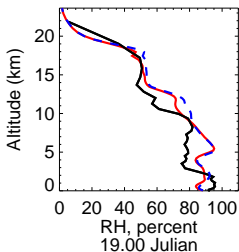
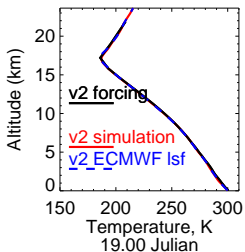
Comparison with ECMWF forcing style

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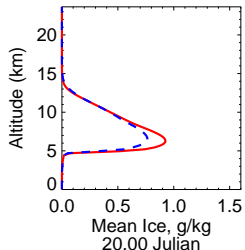
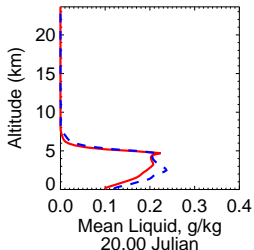
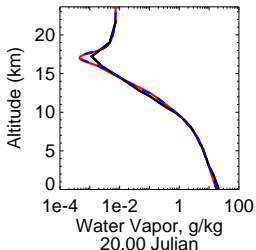
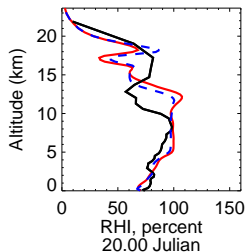
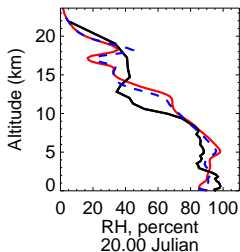
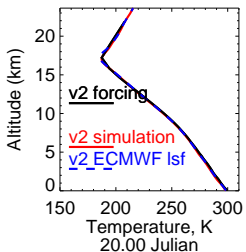
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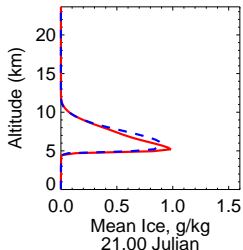
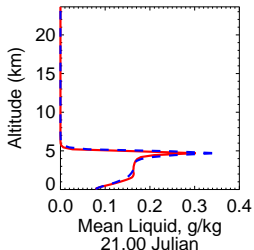
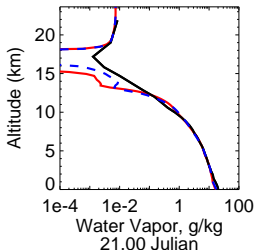
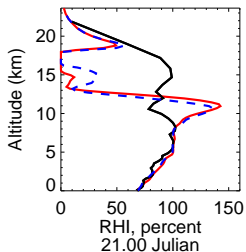
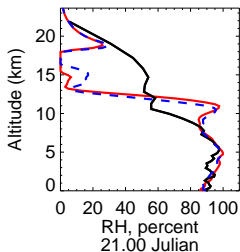
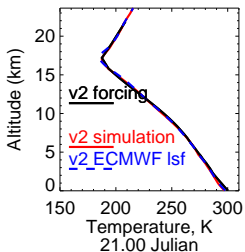
Comparison with ECMWF forcing style

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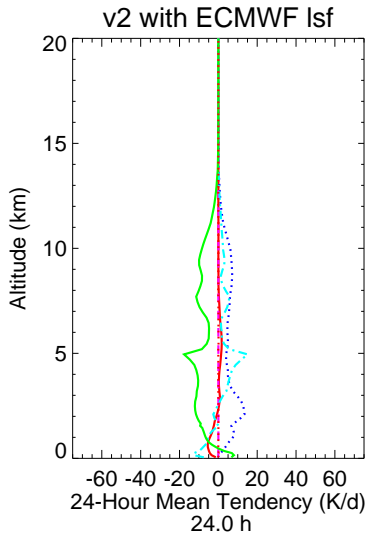
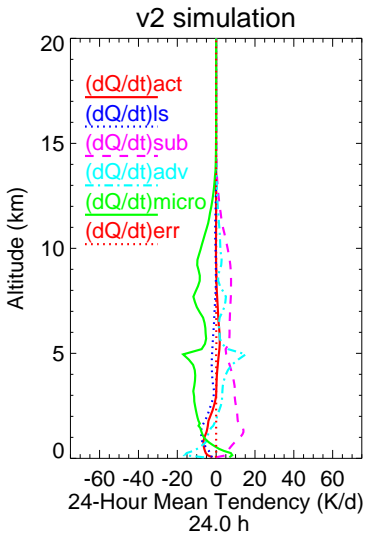


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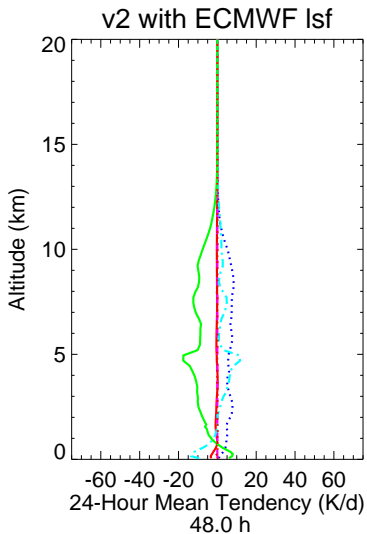
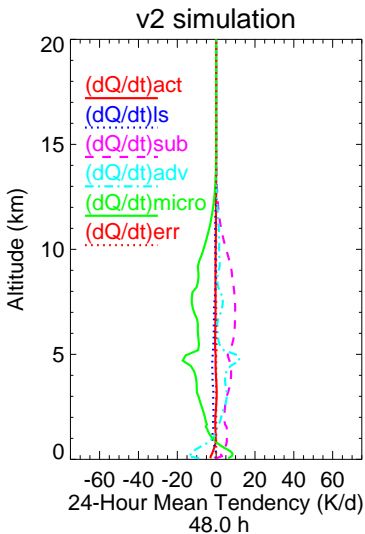
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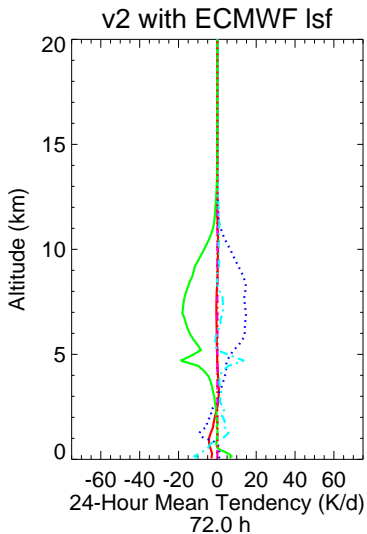
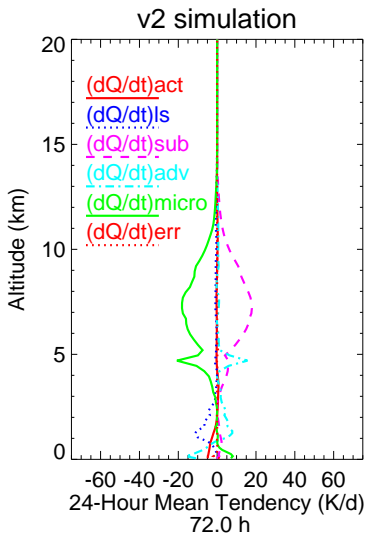
Moisture budget



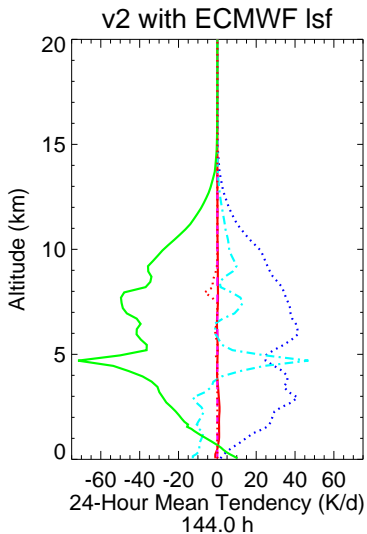
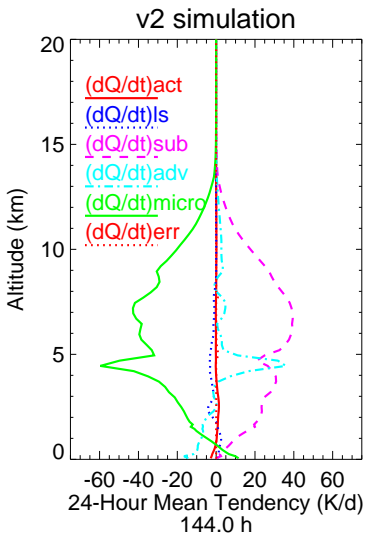
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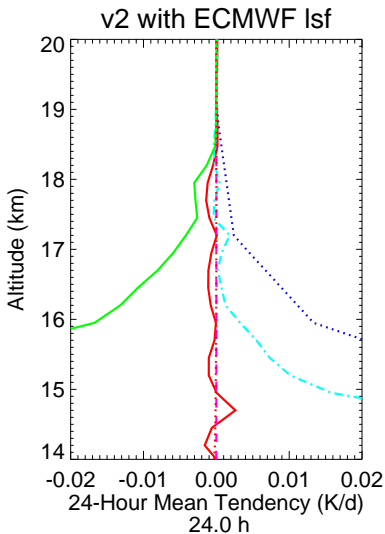
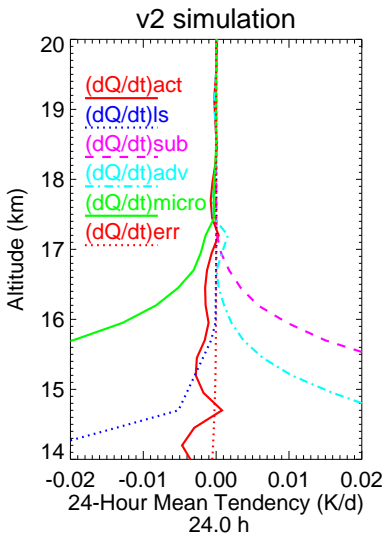
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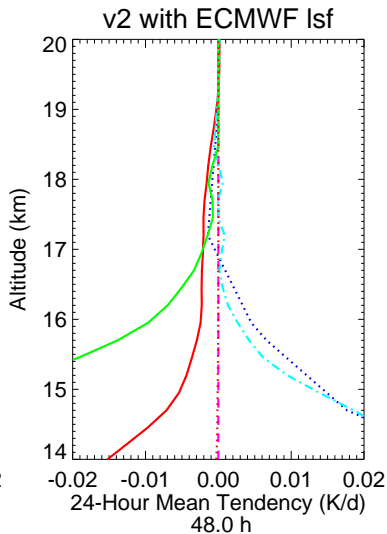
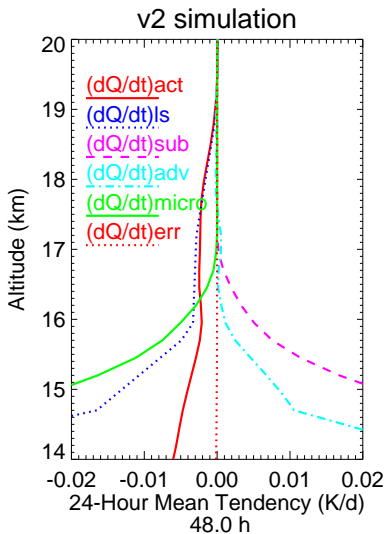
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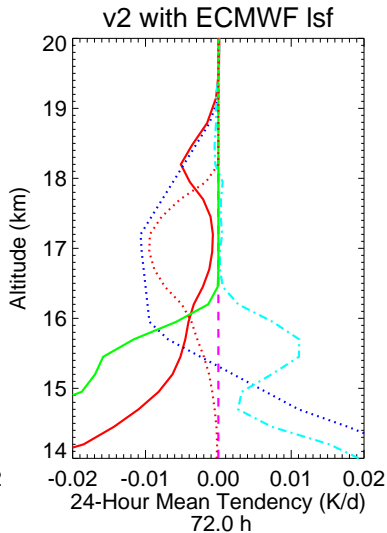
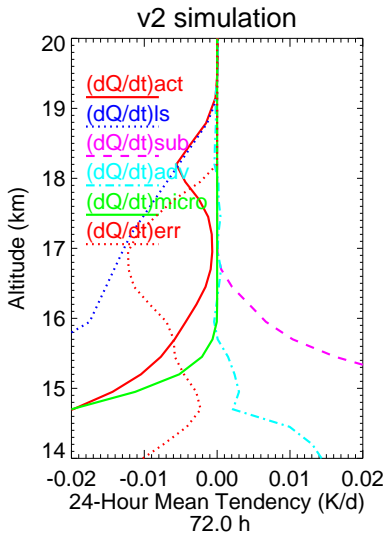
Moisture budget at the tropopause



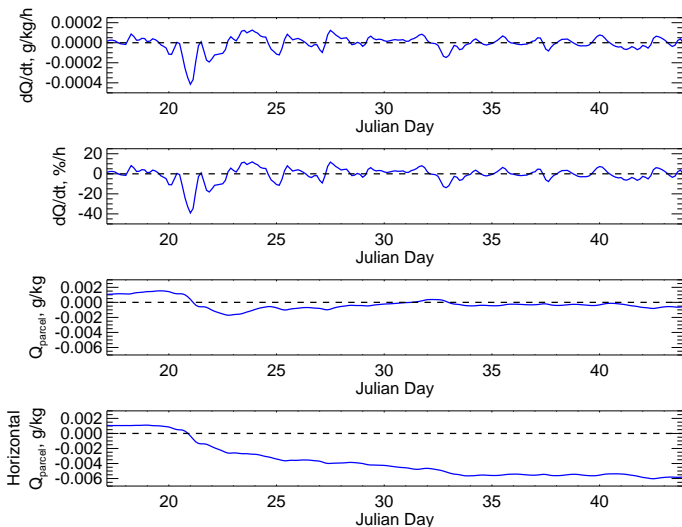
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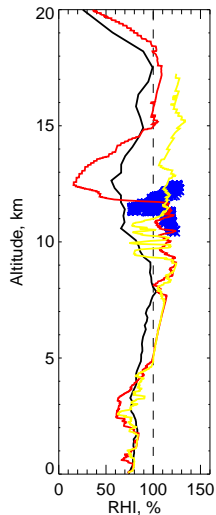
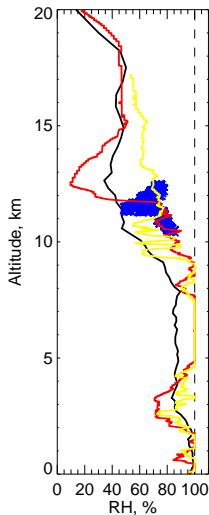
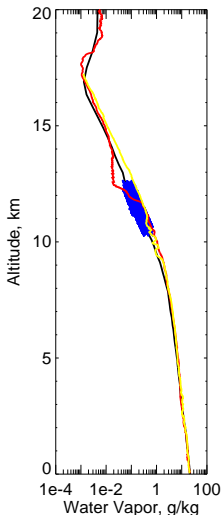
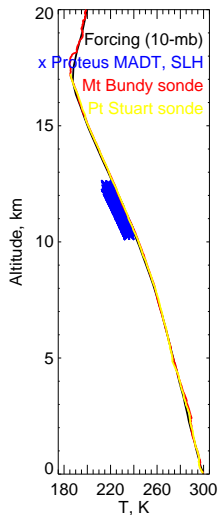


Parcel model at the tropopause



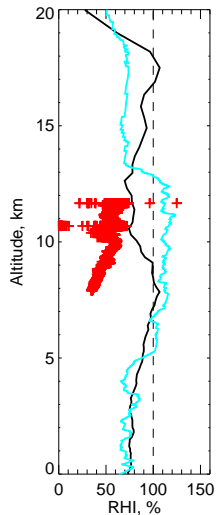
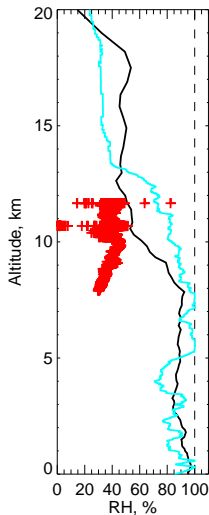
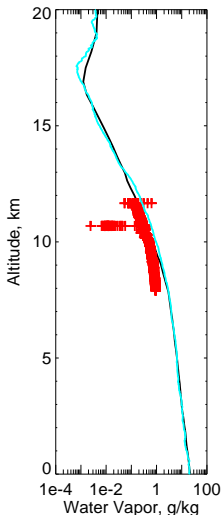
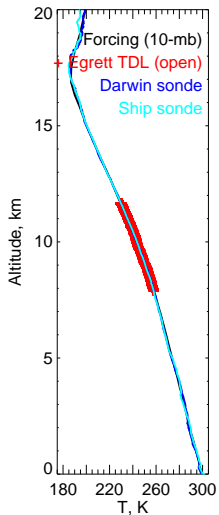
Water vapor measurements

1/20 3 UTC



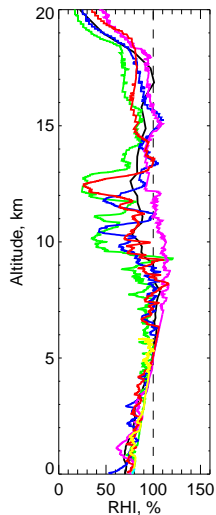
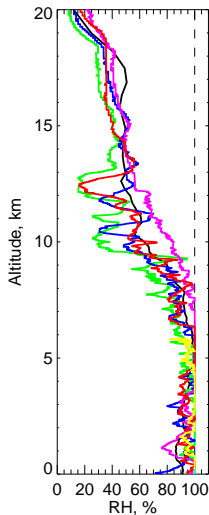
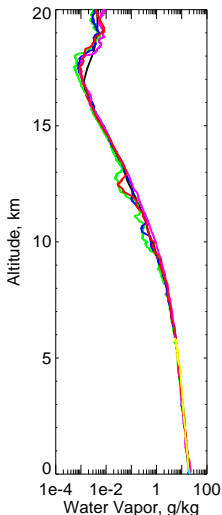
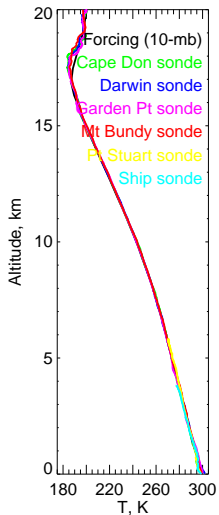
Water vapor measurements

1/20 6 UTC

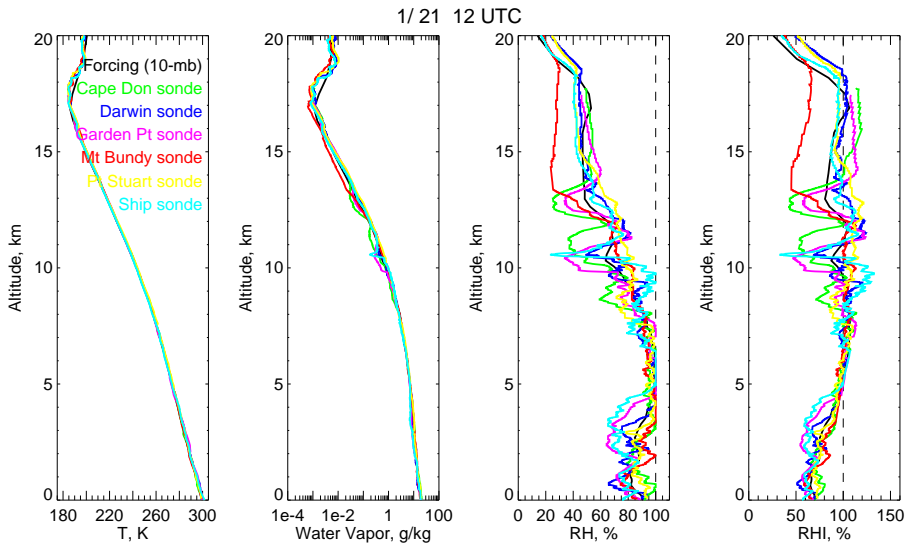


Water vapor measurements

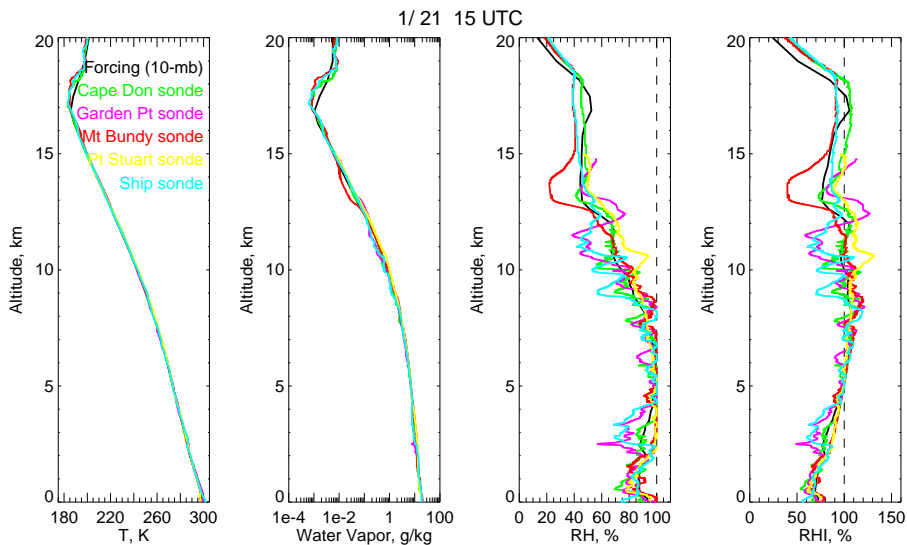
1/21 6 UTC



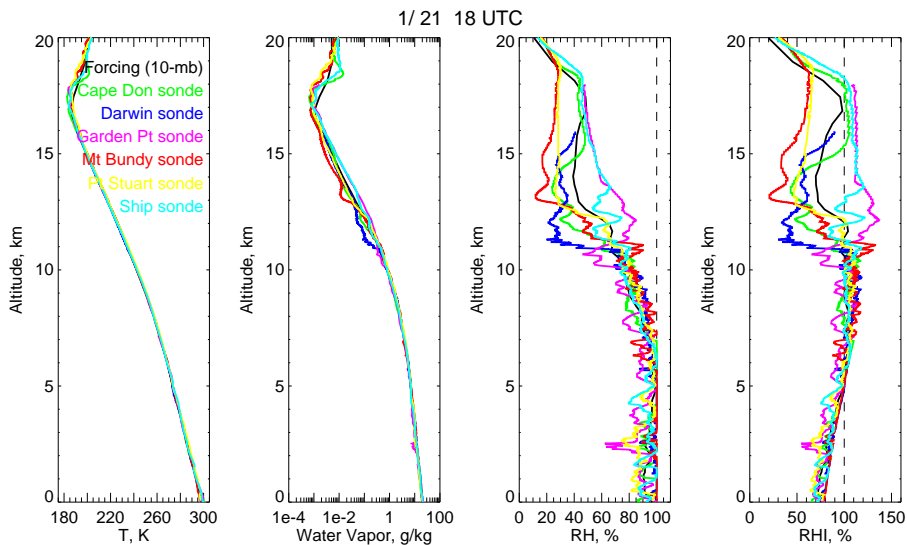
Water vapor measurements



Water vapor measurements

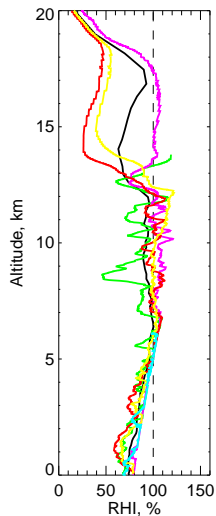
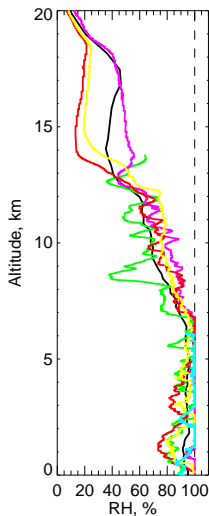
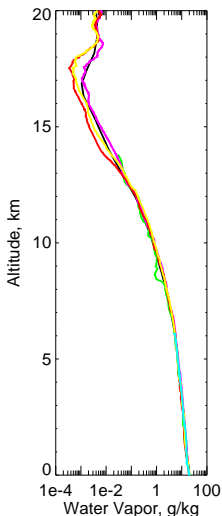
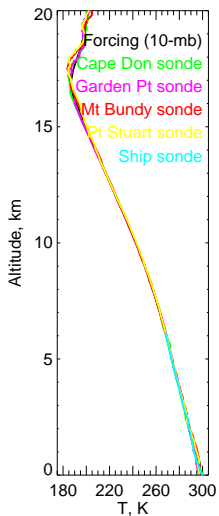


Water vapor measurements

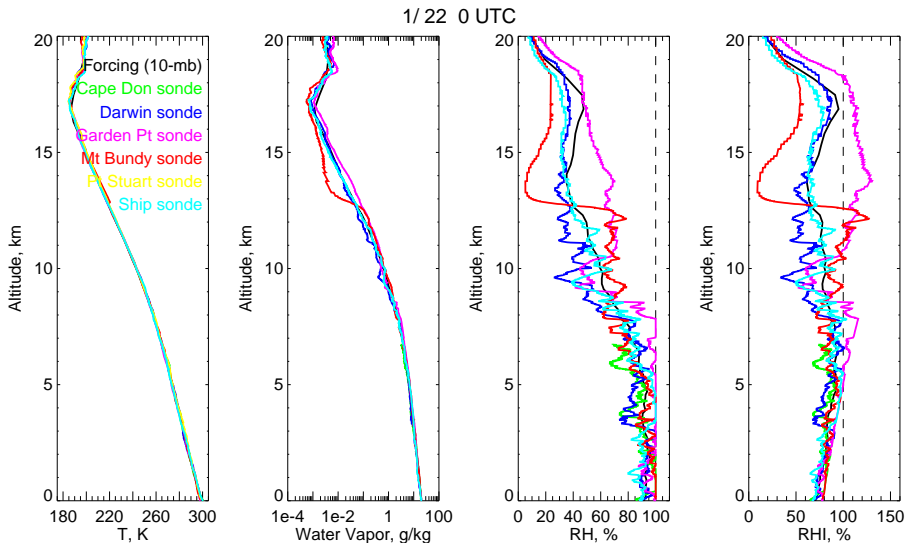


Water vapor measurements

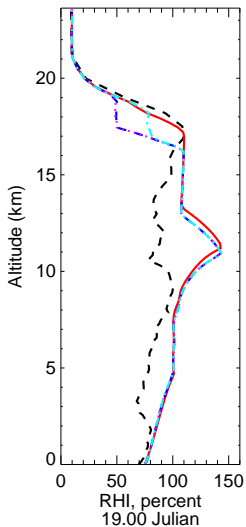
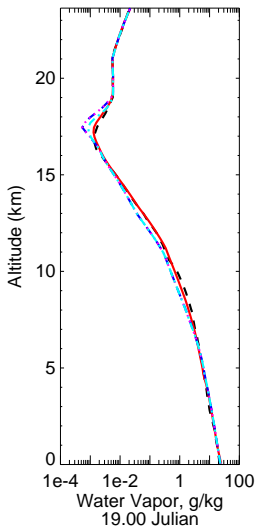
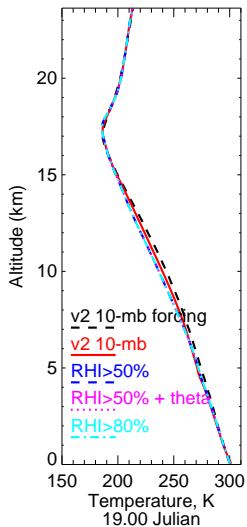
1/21 21 UTC



Water vapor measurements

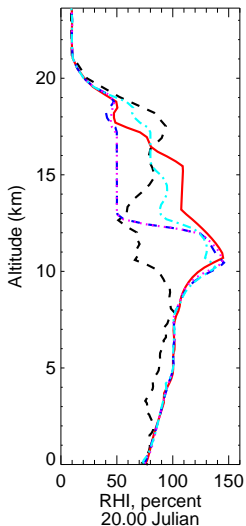
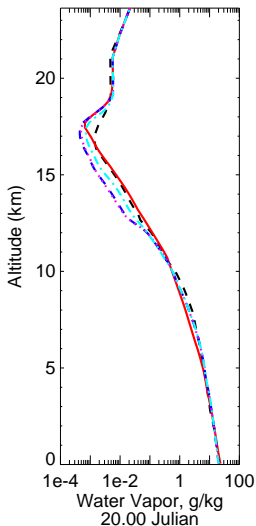
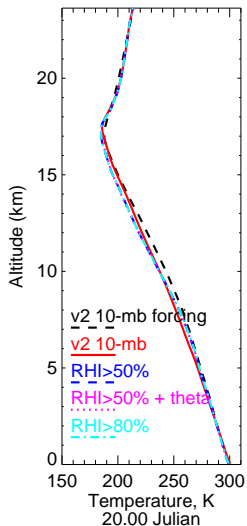


Layer-mean RHI limits

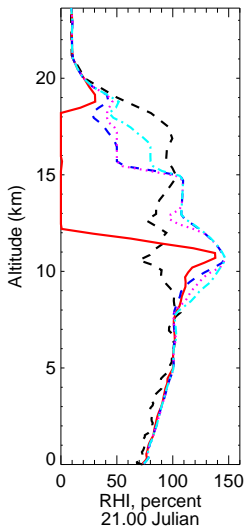
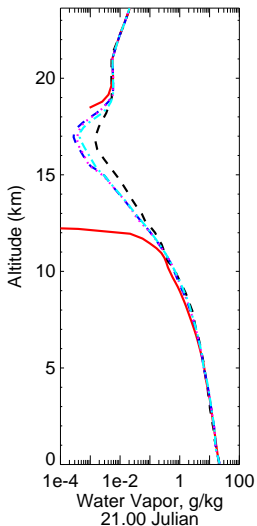
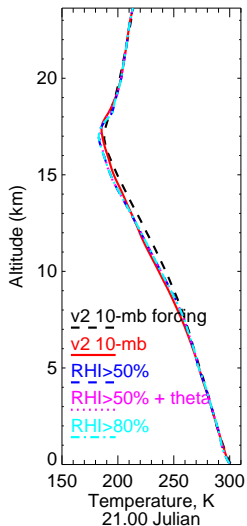




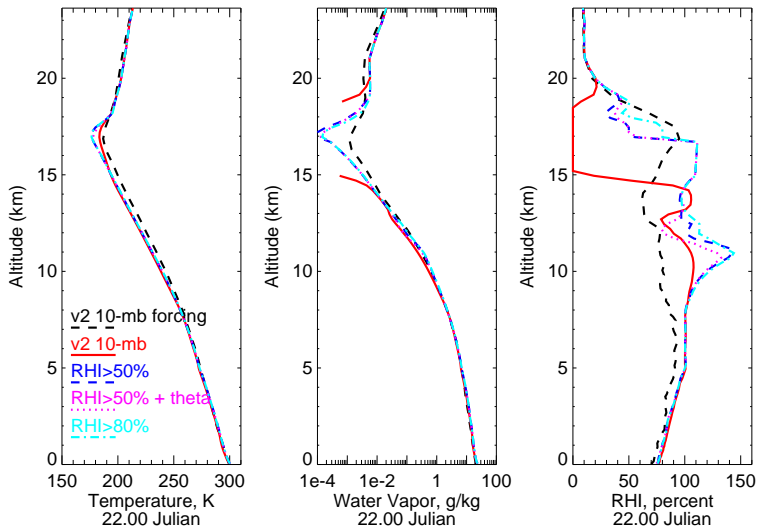
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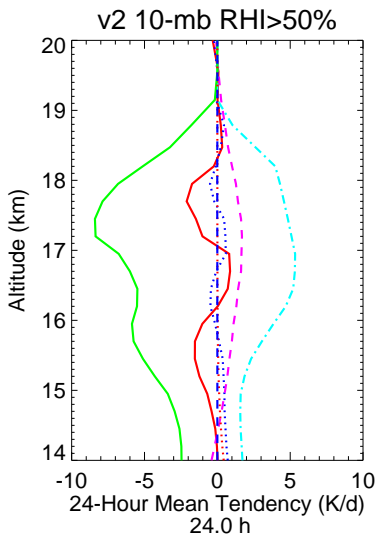
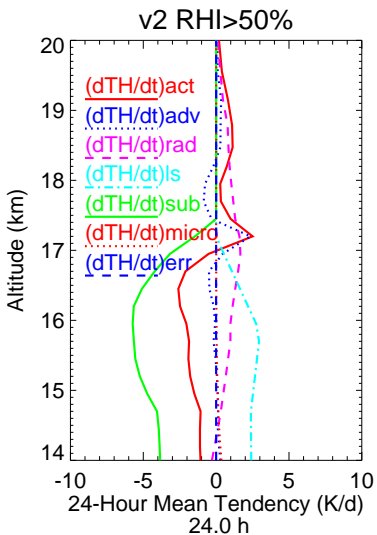
Layer-mean RHI limits



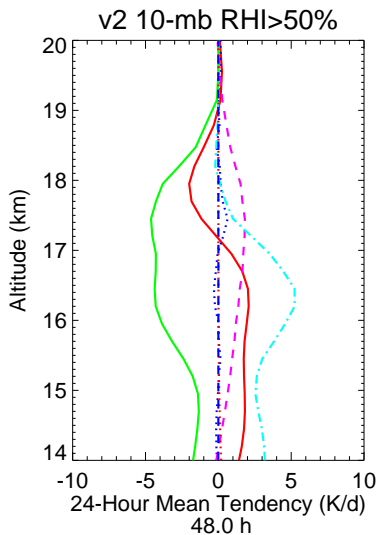
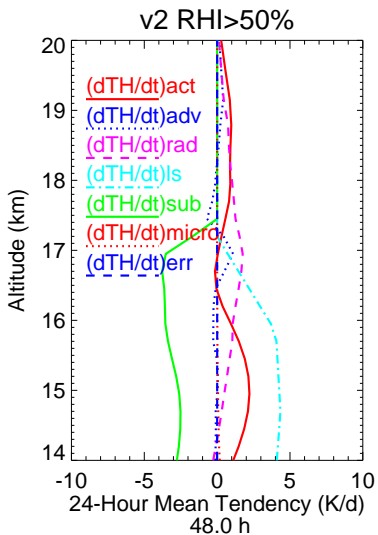
Layer-mean RHI limits



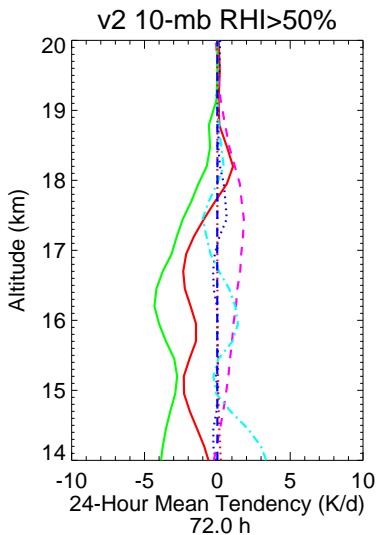
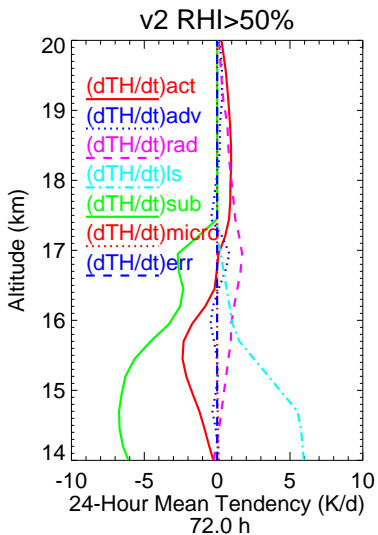
RHI limits



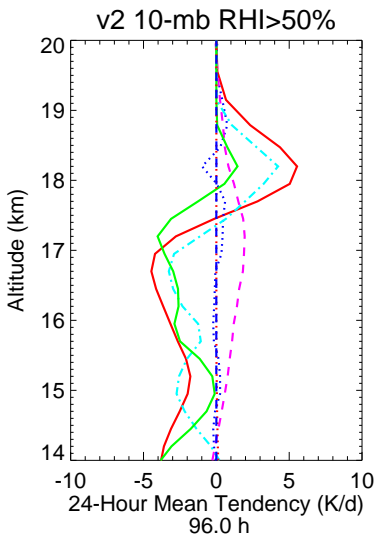
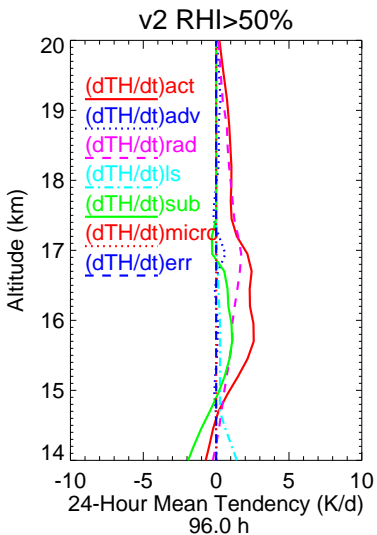
RHI limits



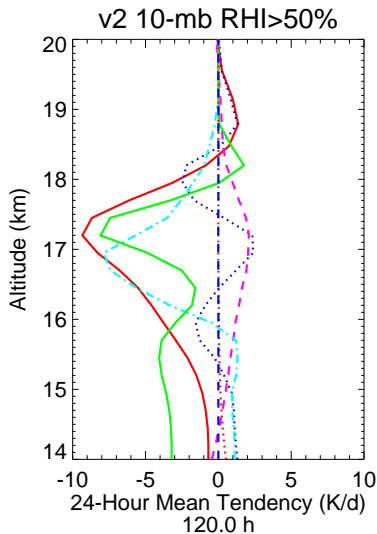
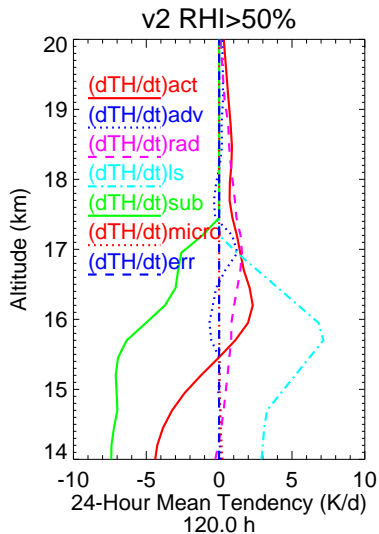
RHI limits



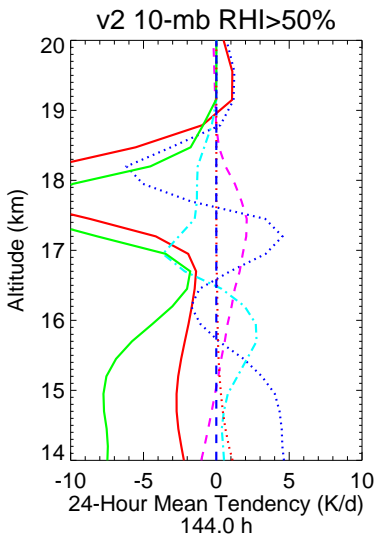
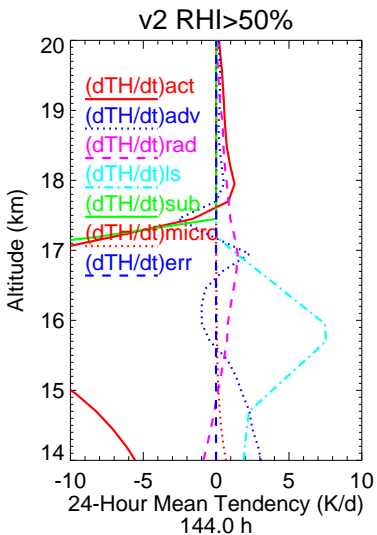
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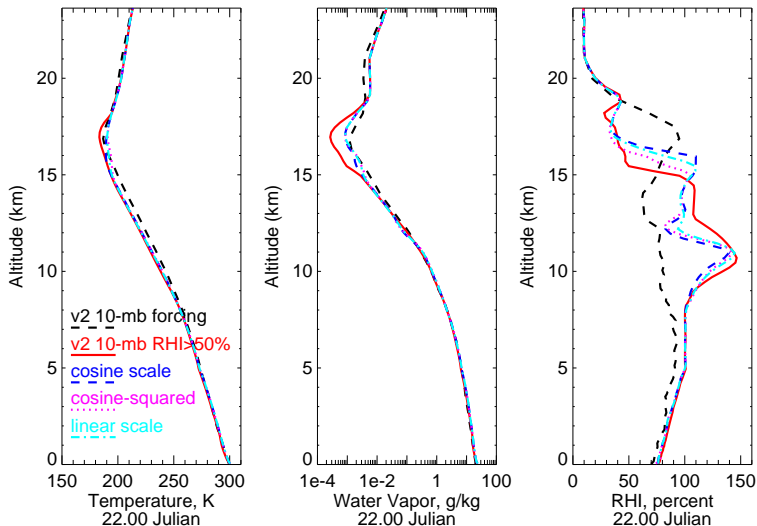
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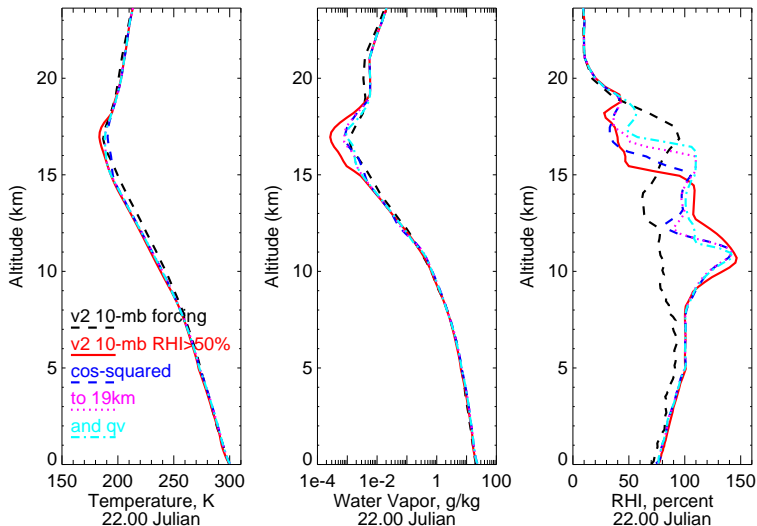
RHI limits



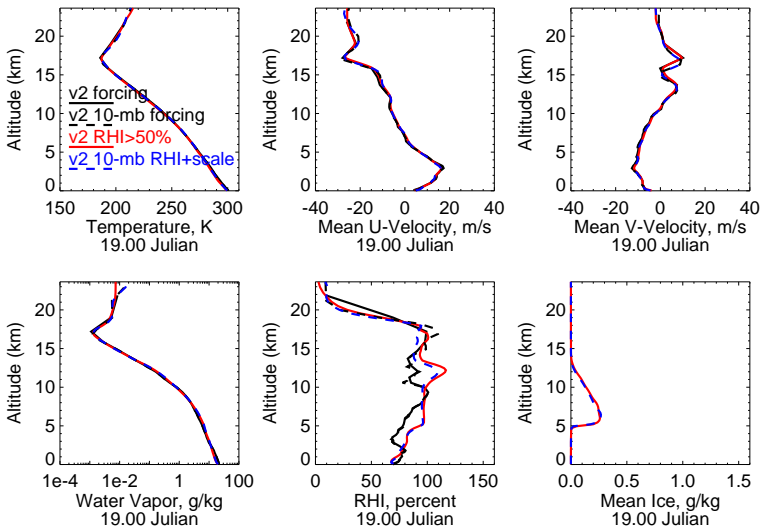
Scaling ascent and advection terms at 10–17 km



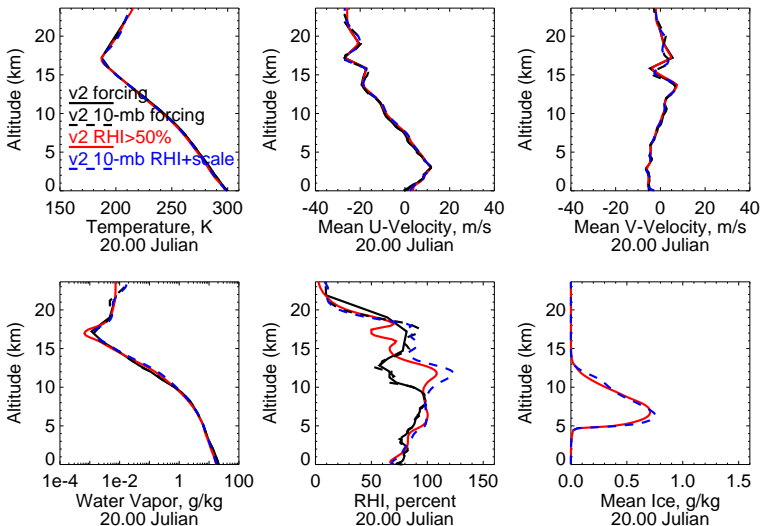
Scaling ascent and advection terms at 10–19 km



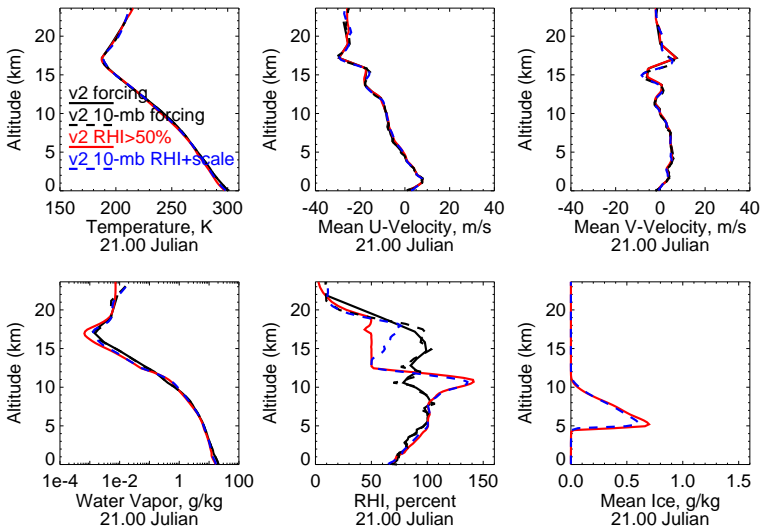
25-mb and 10-mb forcings



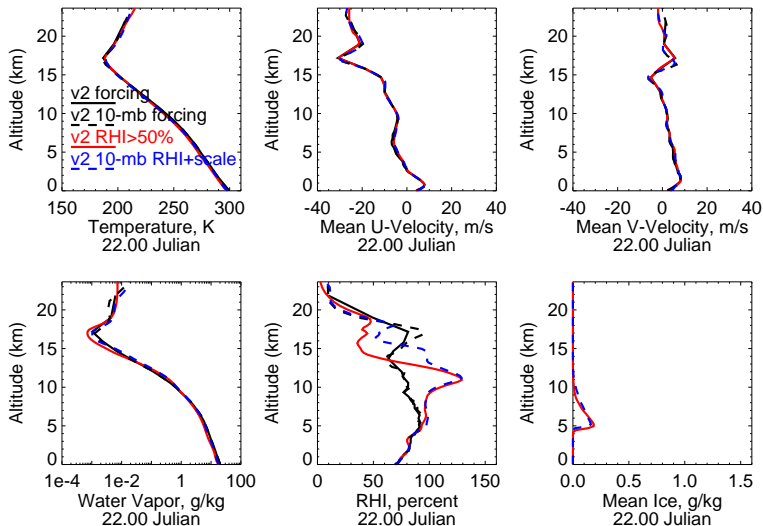
25-mb and 10-mb forcings



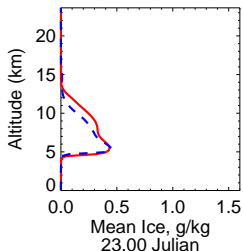
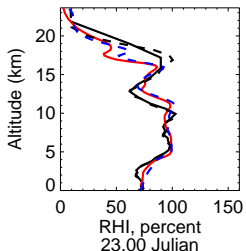
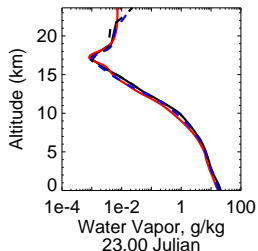
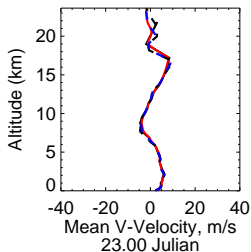
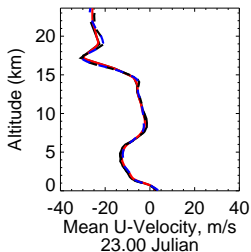
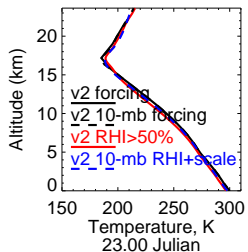
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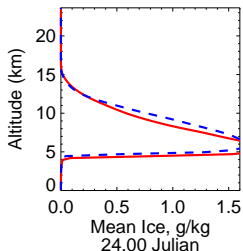
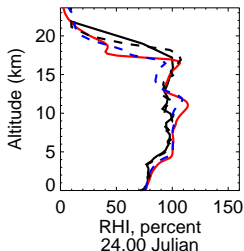
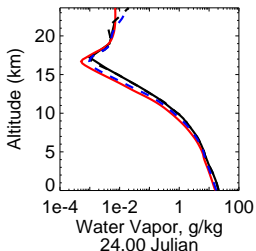
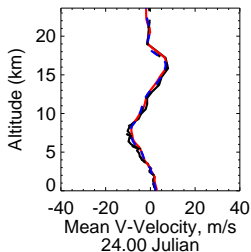
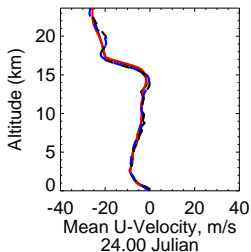
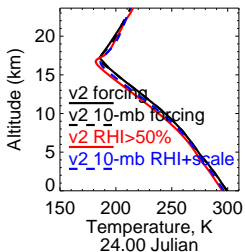
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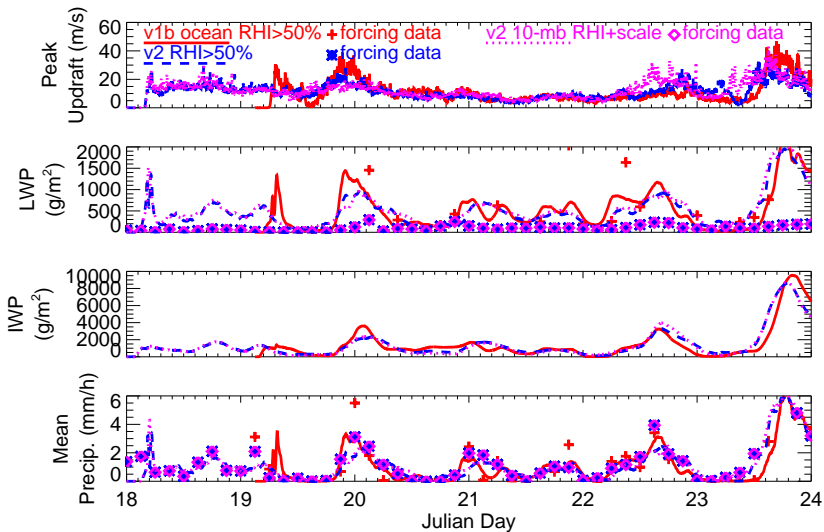
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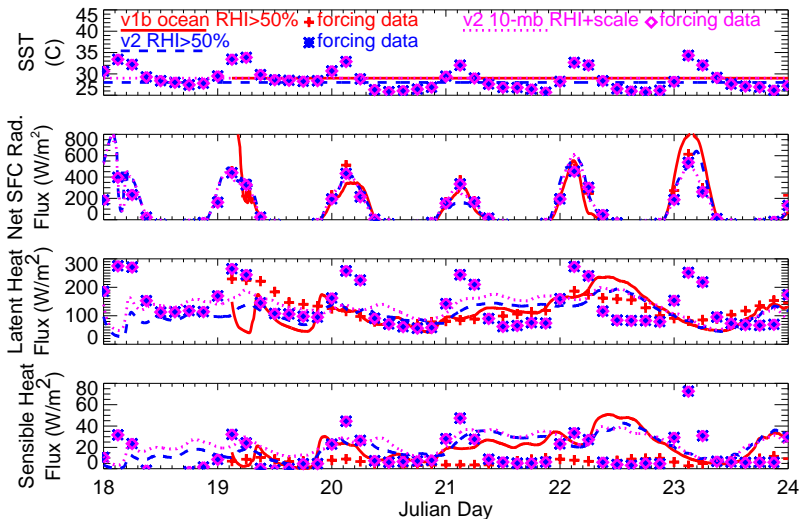
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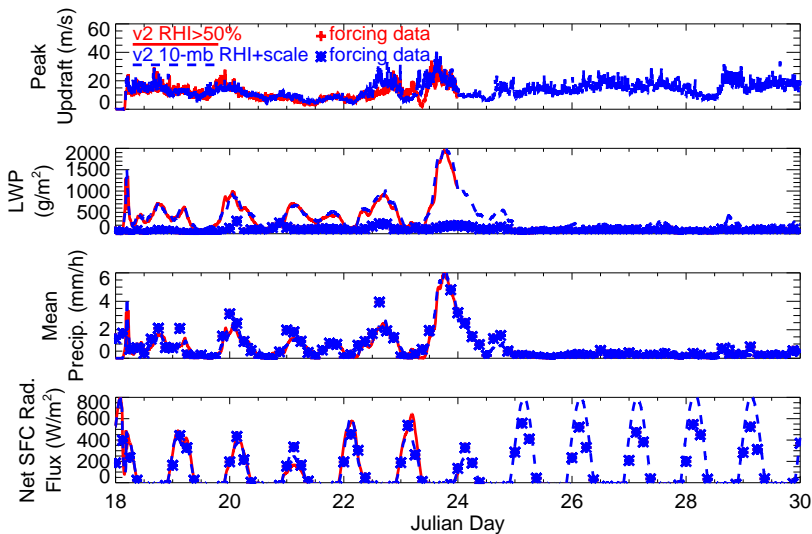
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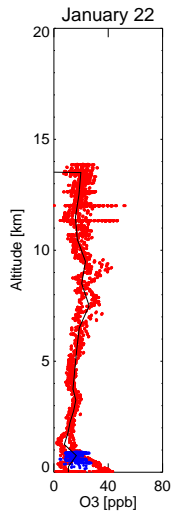
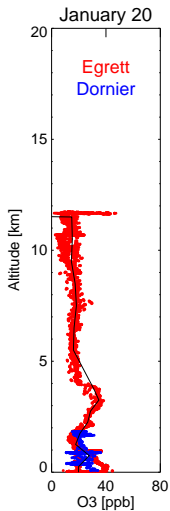
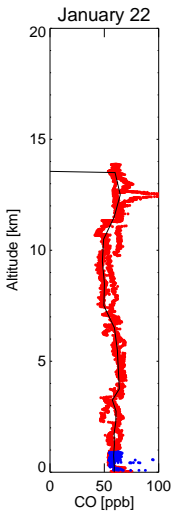
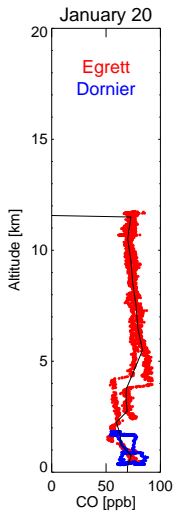
25-mb and 10-mb forcings



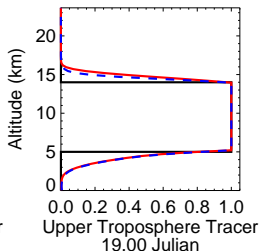
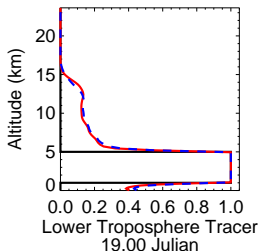
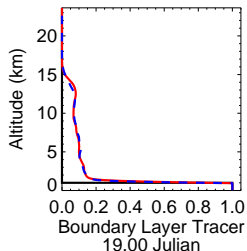
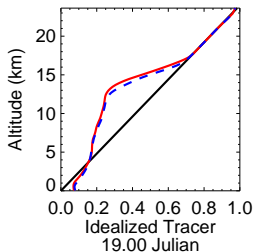
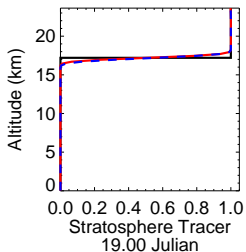
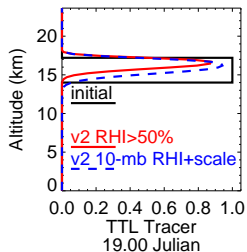
25-mb and 10-mb forcings



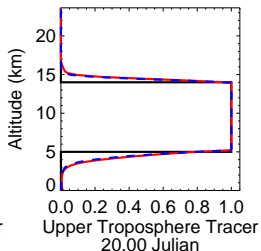
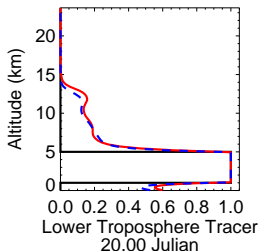
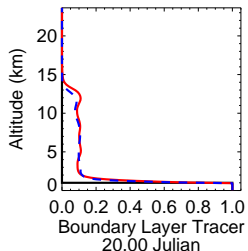
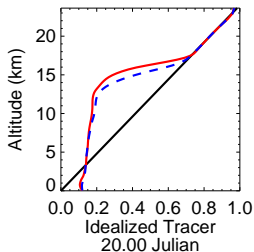
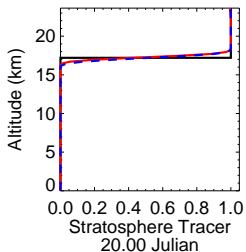
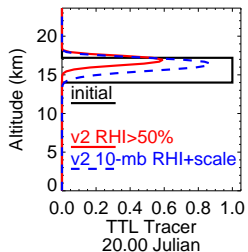
Trace gases



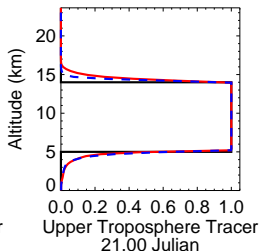
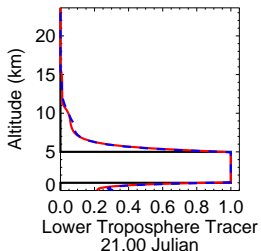
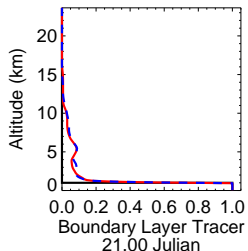
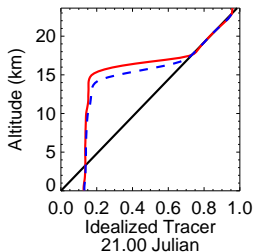
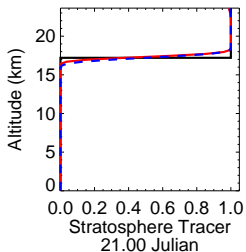
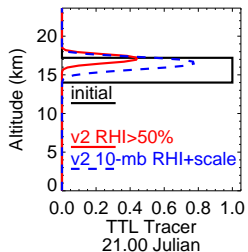
Idealized tracers



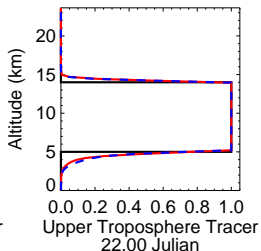
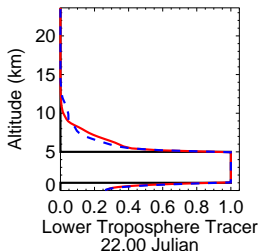
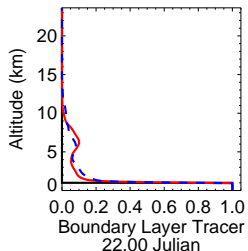
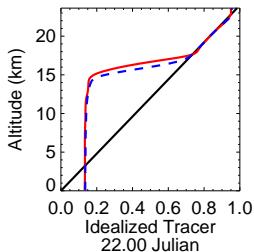
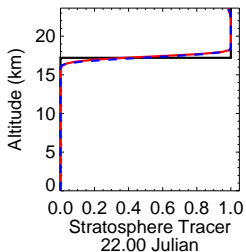
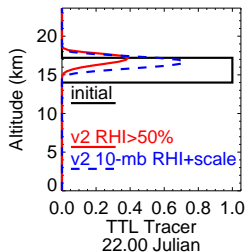
Idealized tracers



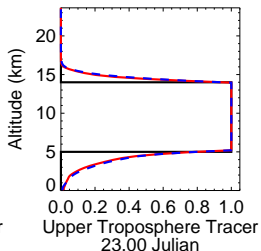
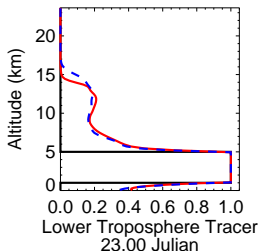
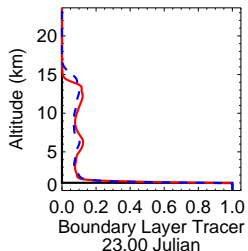
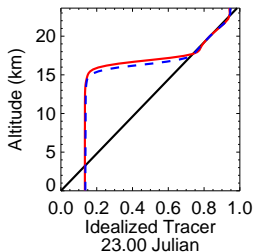
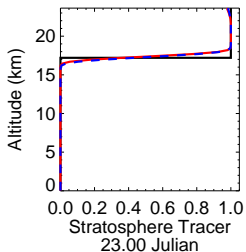
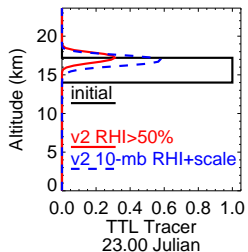
Idealized tracers



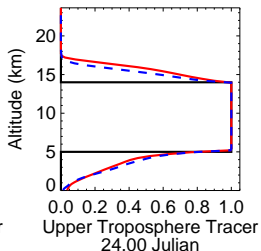
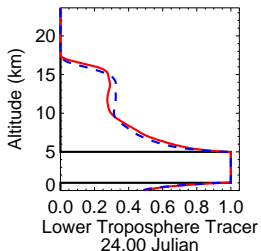
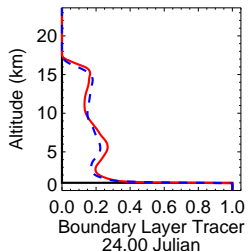
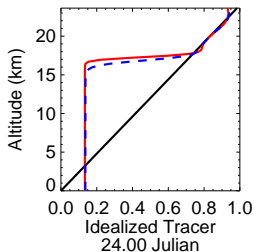
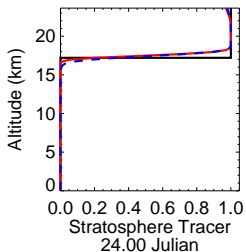
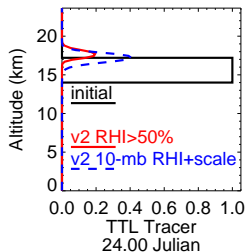
Idealized tracers



Idealized tracers



Idealized tracers



Plans

- complete consensus case study description
 - moisture and temperature at the tropopause
 - large-scale forcing treatment
 - surface fluxes
- digest in situ aerosol data (number cuts and size distribution)
- work up comparisons with DOE ARM and satellite data
- case description with ECMWF and GISS results for Pan-GCSS
- run GISS simulations with size-resolved microphysics

Intercomparison with data

Model	Source	Approach
Precipitation	Forcing data set	Continuous domain mean
Surface fluxes	Forcing data set	Continuous domain mean
Liquid water path	Microwave radiometer	Model values envelope
Ice water path	Liu retrieval	Continuous domain mean
Water vapor	In situ	Statistical analysis
Cloud structure	C-pol radar	Statistical analysis
Rain drop NSD	S-band, disdrometer	Model values envelope
Ice NSD	In situ, satellite	Statistical analysis
Cloud boundaries	ARSCL	Model values envelope
Atmospheric heating	BBHRP	Model values envelope
Anvil ice habit	In situ	Qualitative
Tracer transport	In situ	Statistical analysis