EGU General Assembly 2022

Earth – Evolution at the dry limit

Universität zu Köln

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Understanding atmospheric differences in the water vapor transport for the Atacama and Namib deserts

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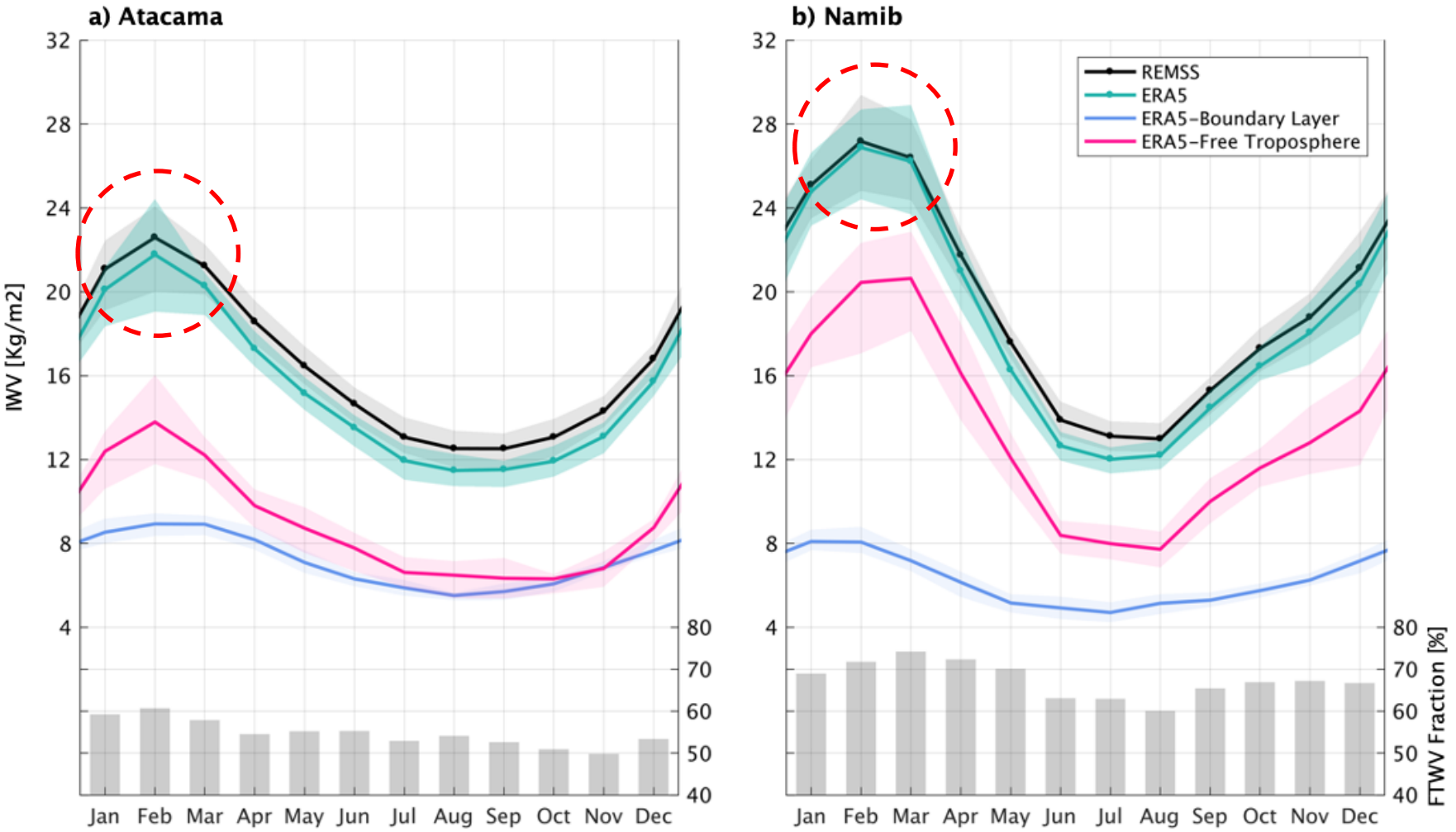
WATER VAPOR SEASONAL CYCLE



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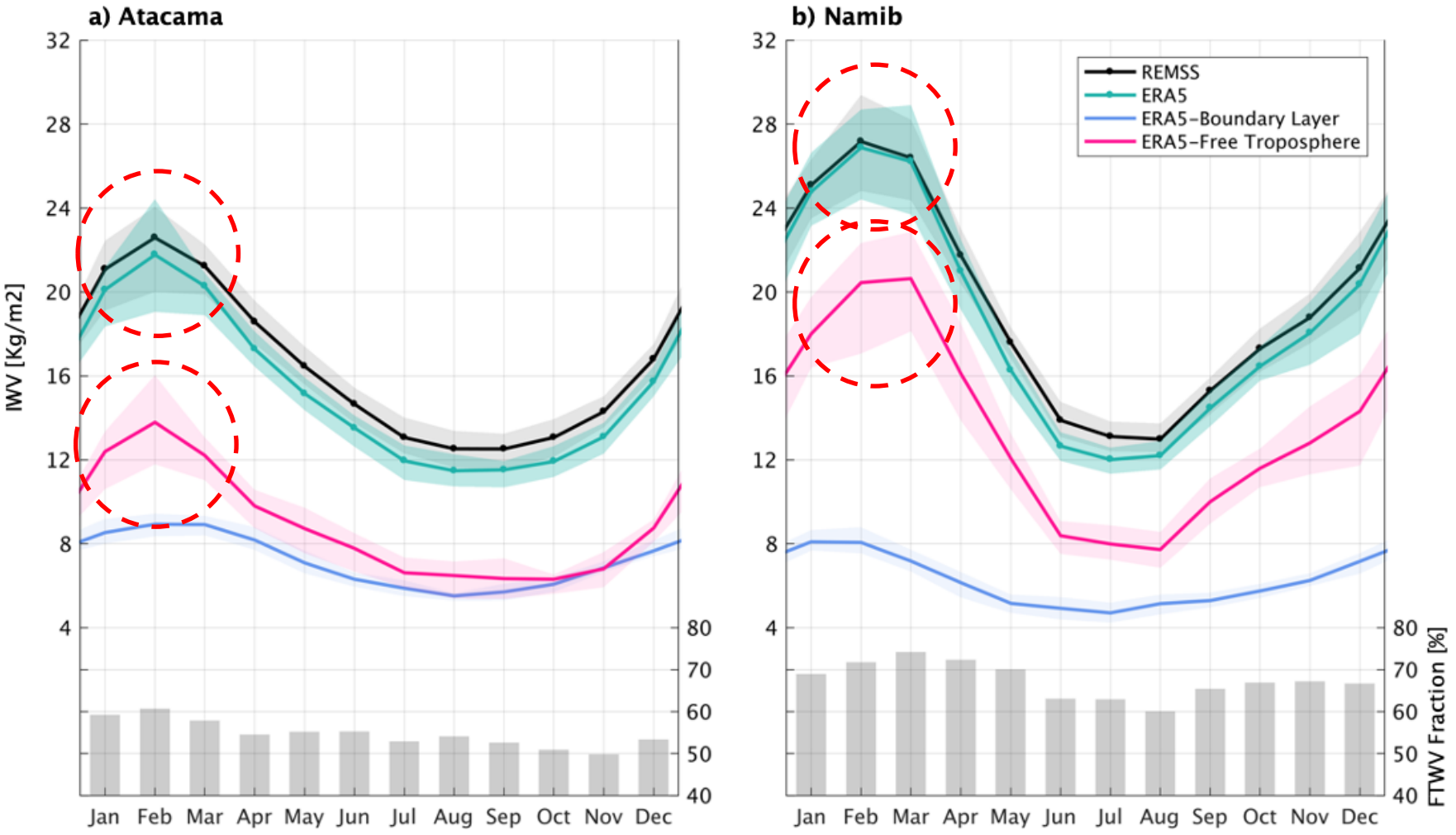

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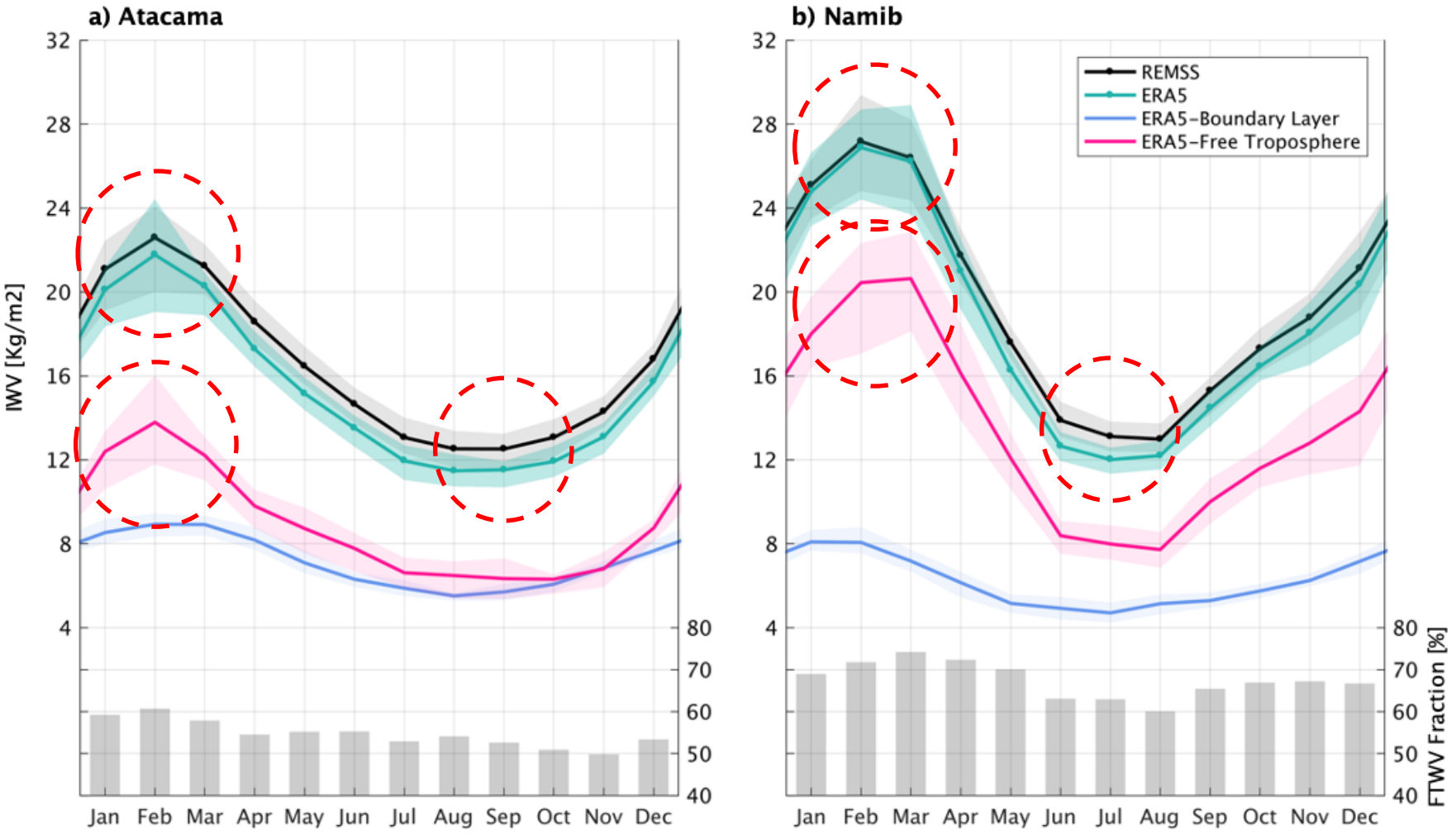

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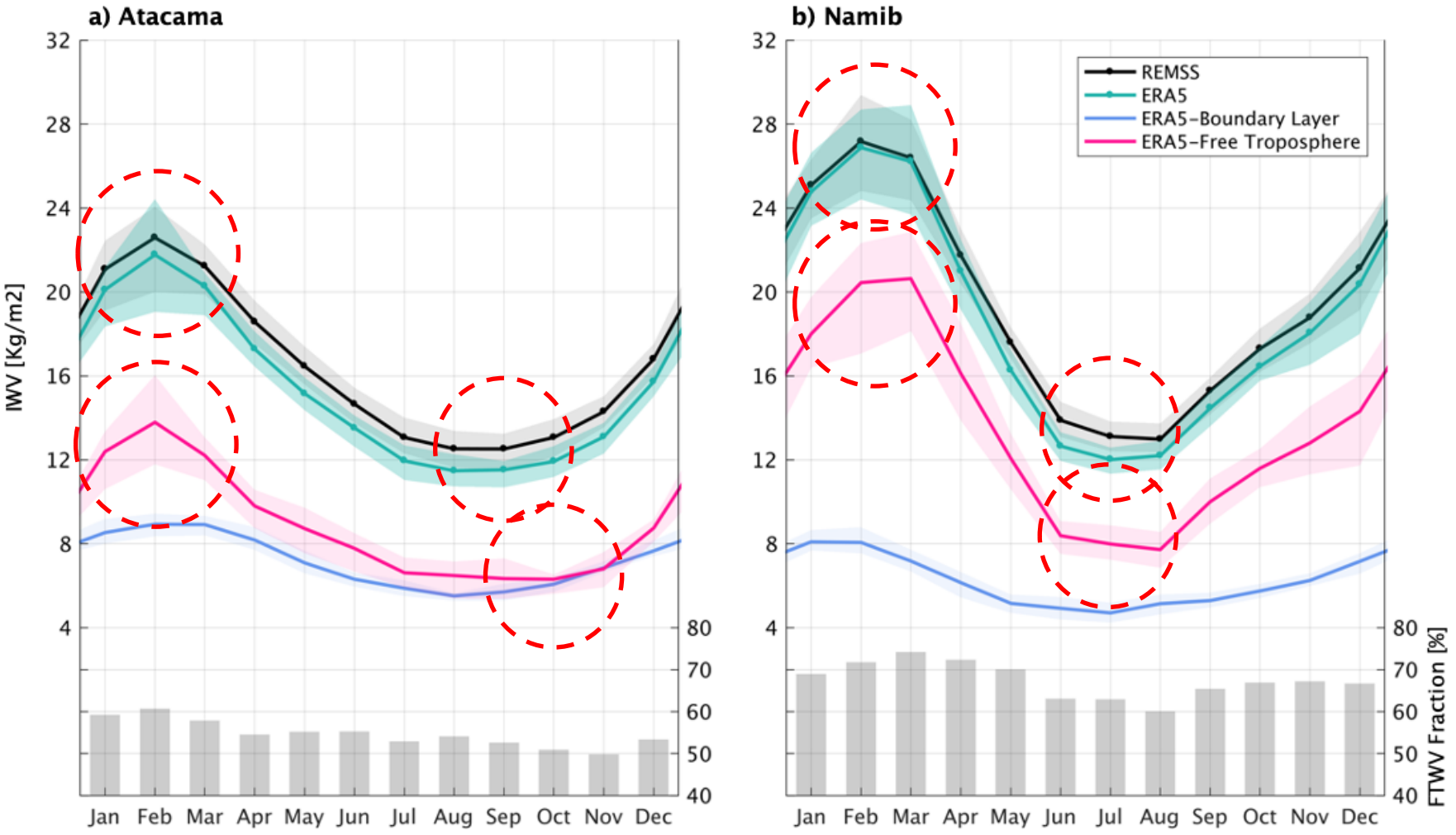

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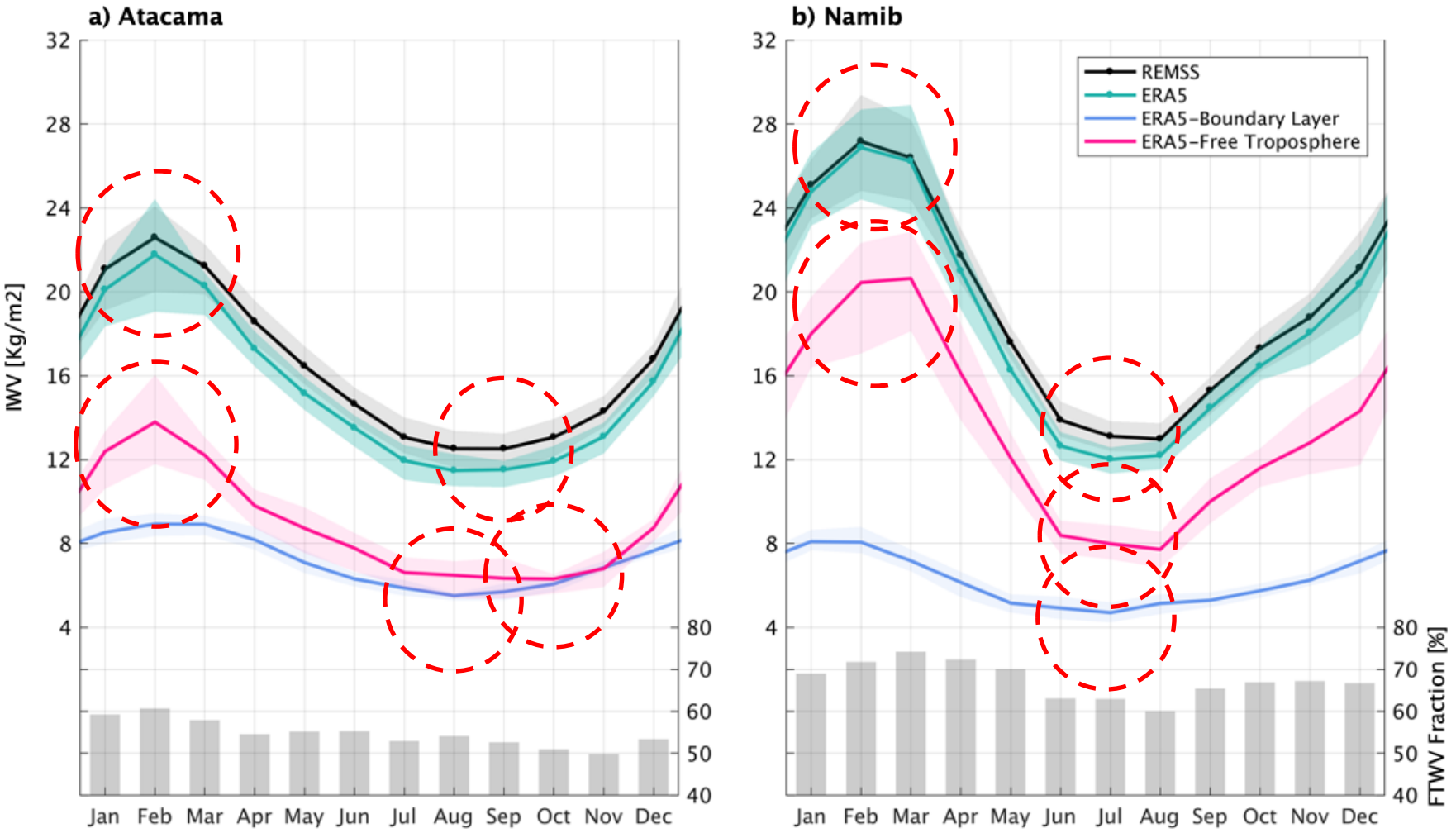

- ✓ Good agreement ERA5/REMSS
- ✓ Use of ERA5 model levels instead of pressure levels

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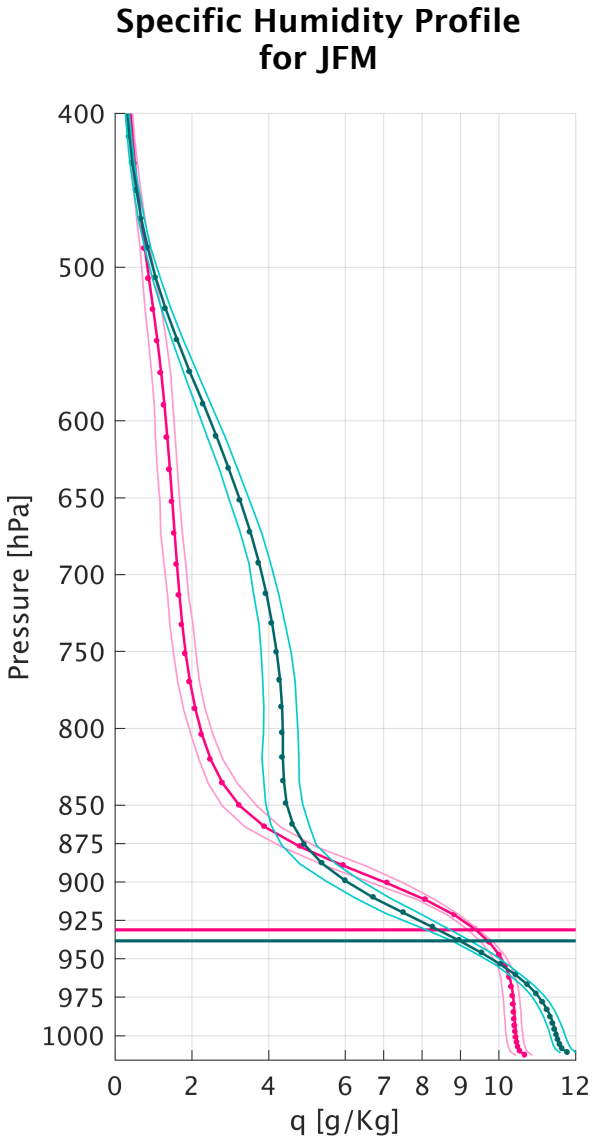
(3) Boundary-Layer minima: JJA for the Namib and JAS in the Atacama.

1) SUMMER WATER VAPOR EXCESS



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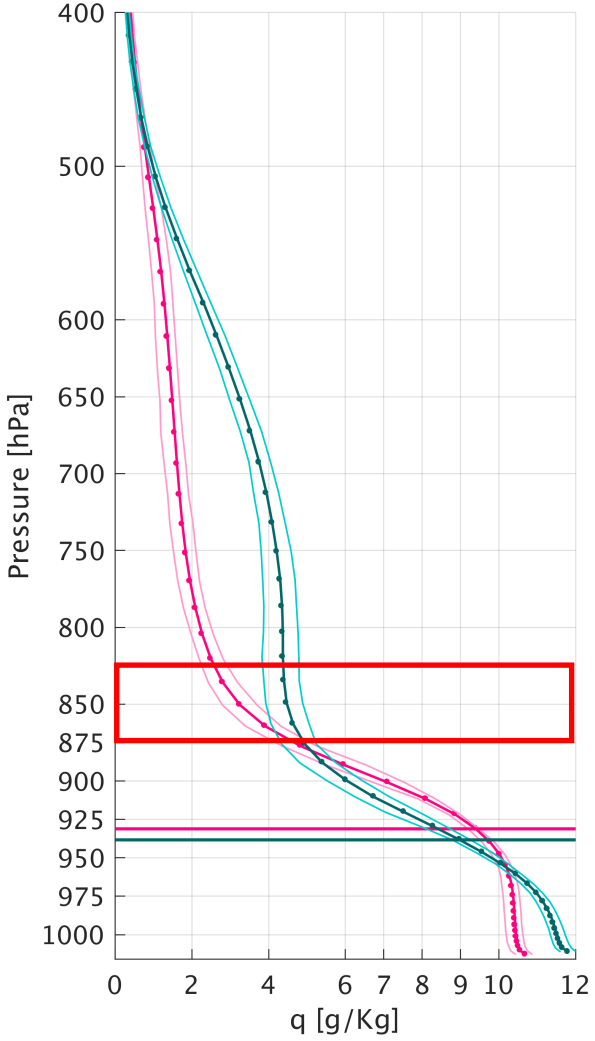
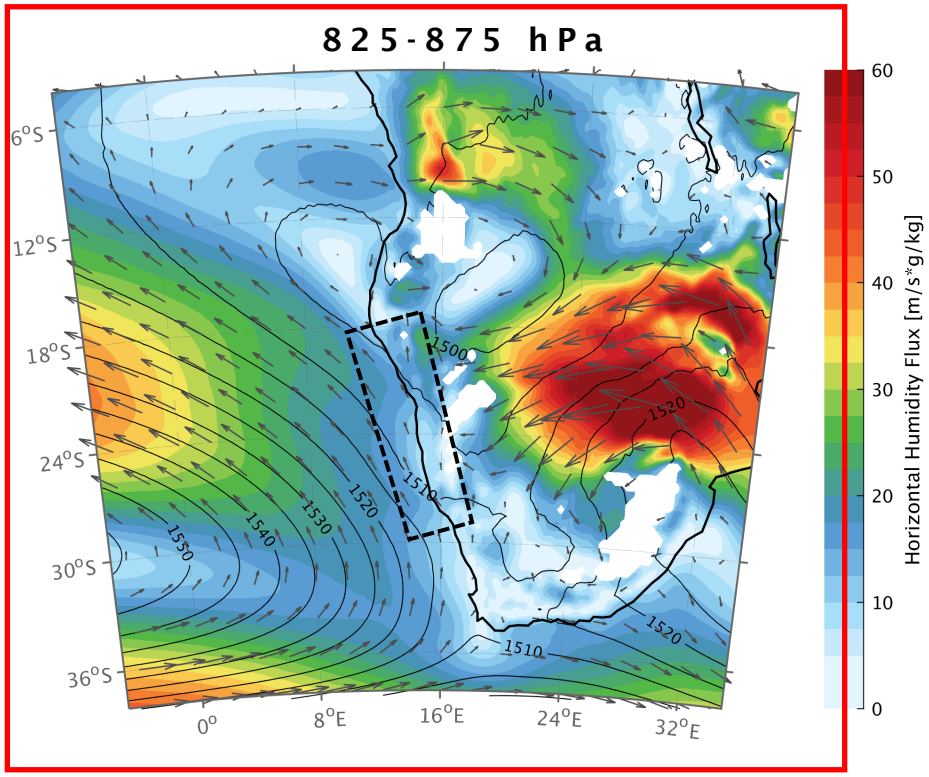
1) SUMMER WATER VAPOR EXCESS

Specific Humidity Profile for JFM



Horizontal Humidity Flux for JFM



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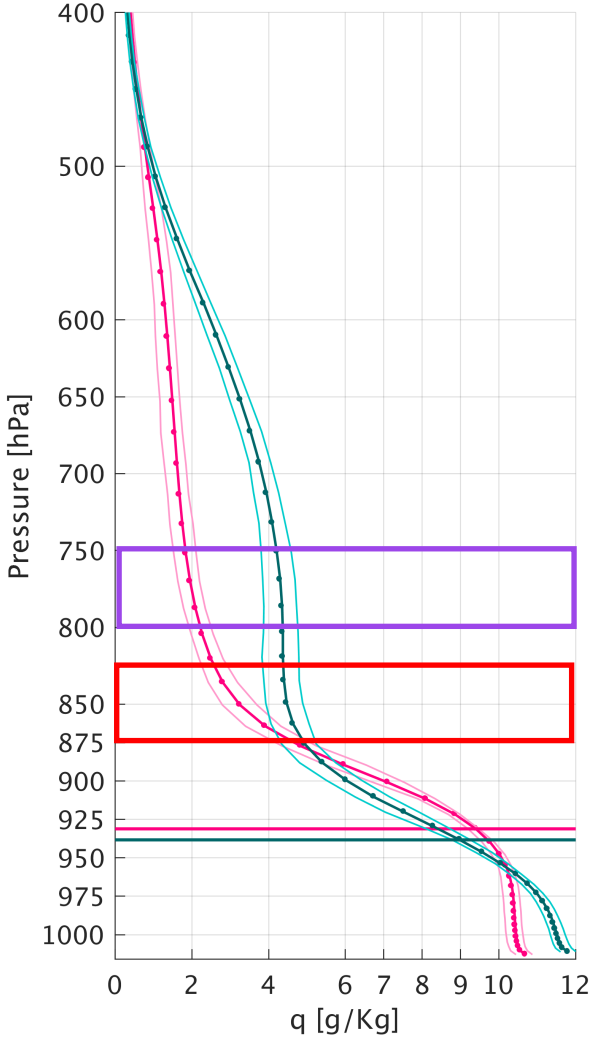

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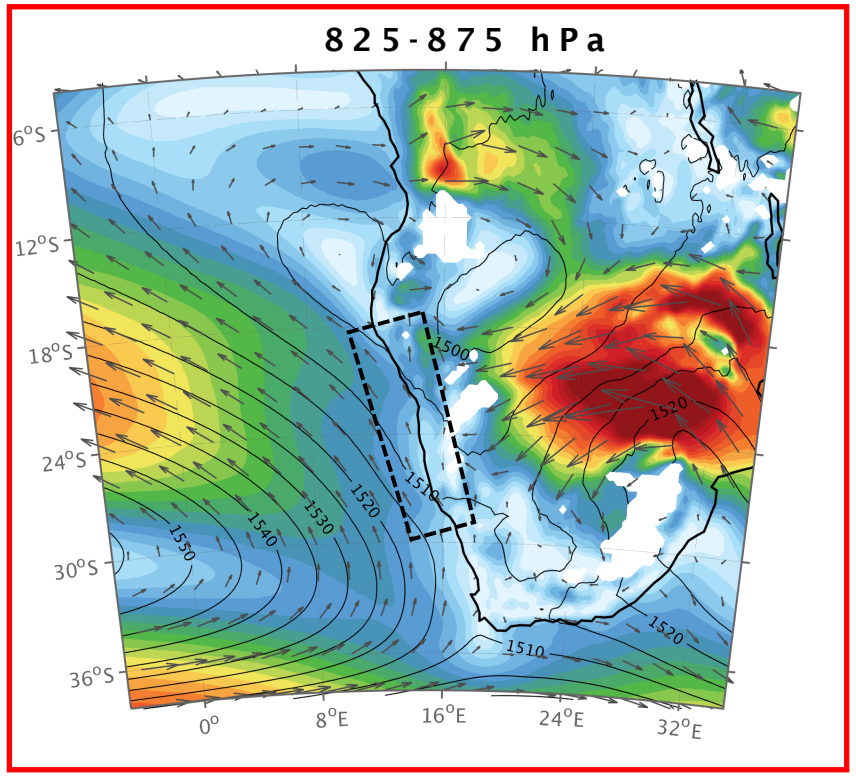
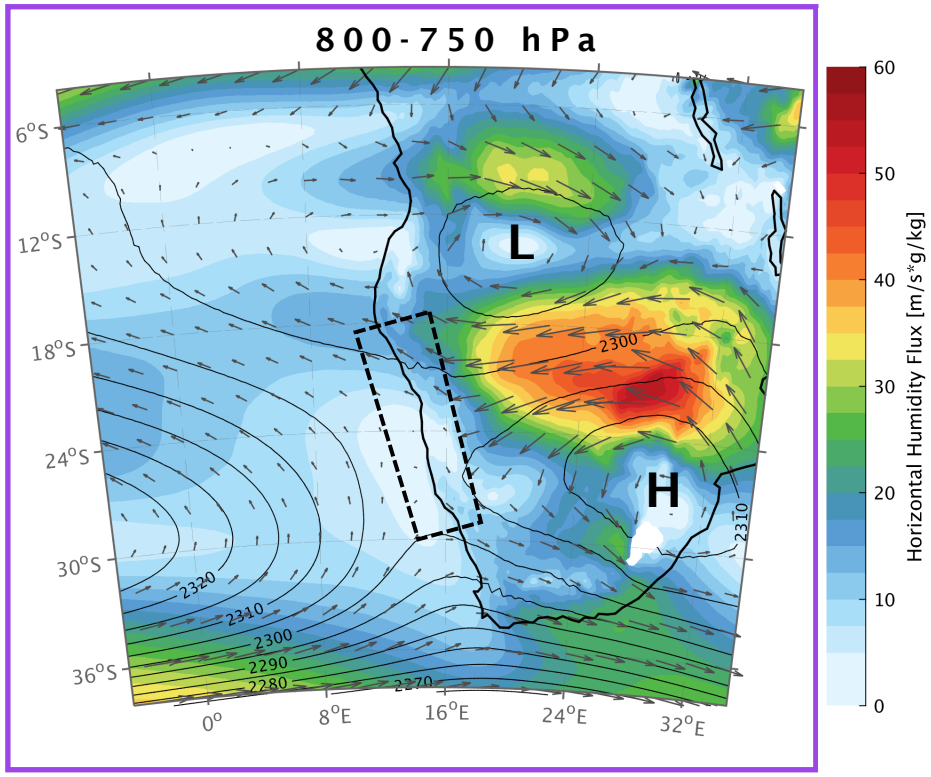
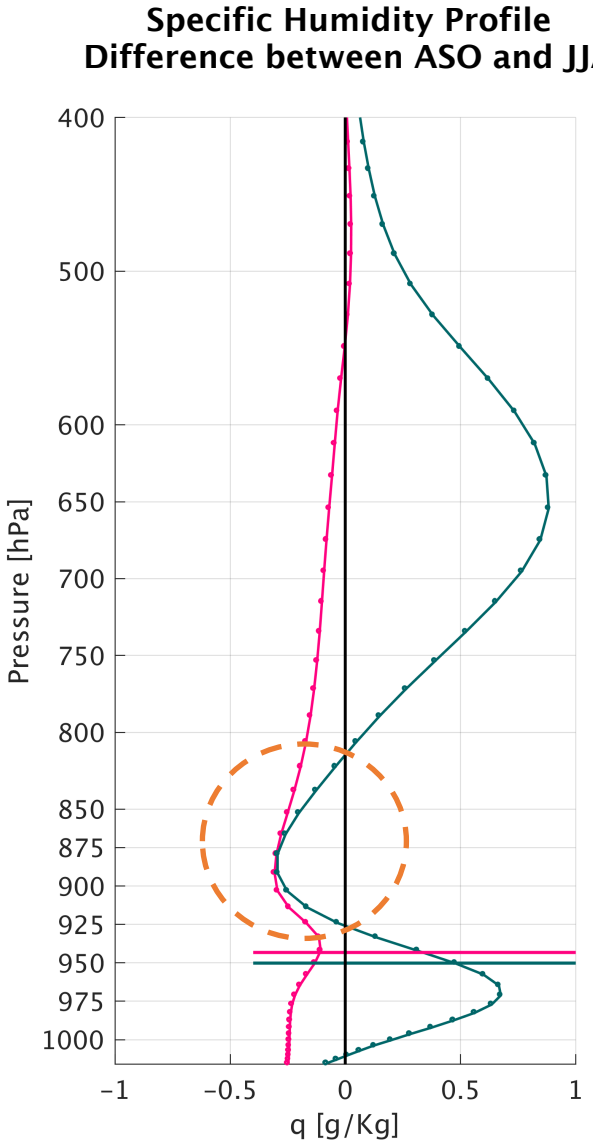




- Free-troposphere present more specific humidity in the Namib than in the Atacama.
- Humidity flux show a clear transport of humidity from the interior of the continent, in association with the Angola Low and the African High.

2) FREE-TROPOSPHERE SHIFTED DRY SEASON



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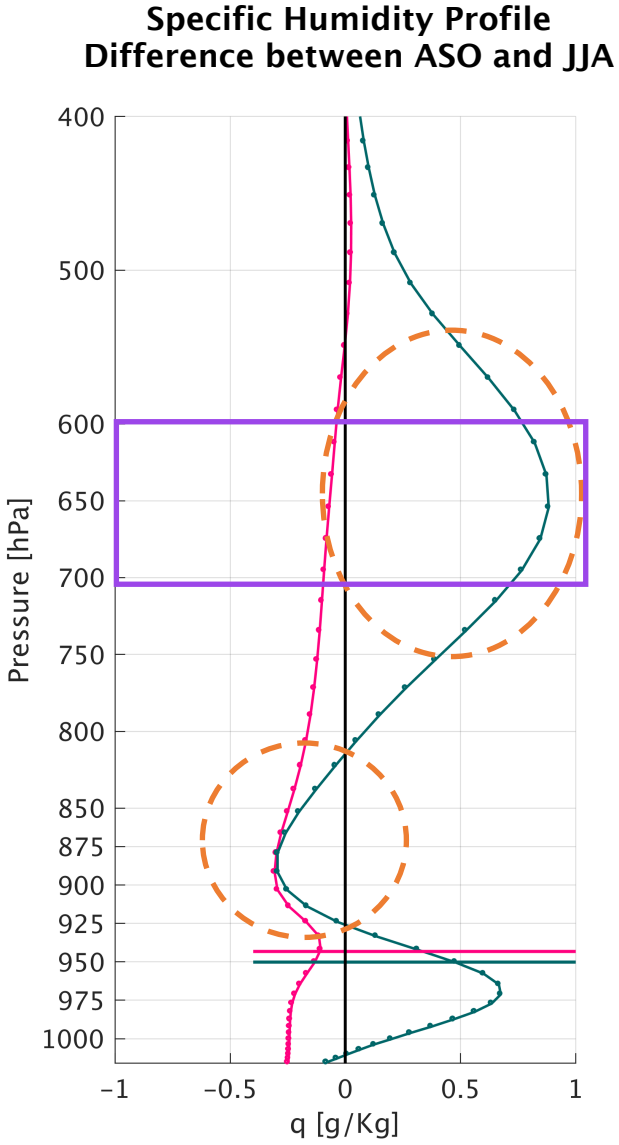
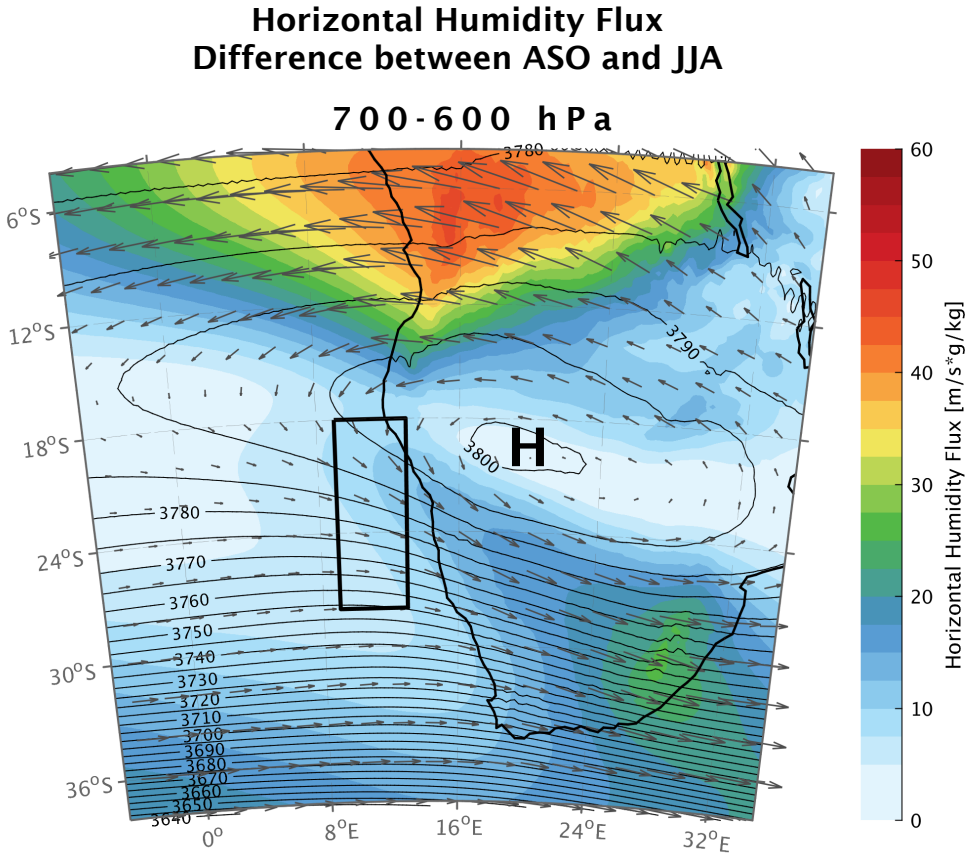
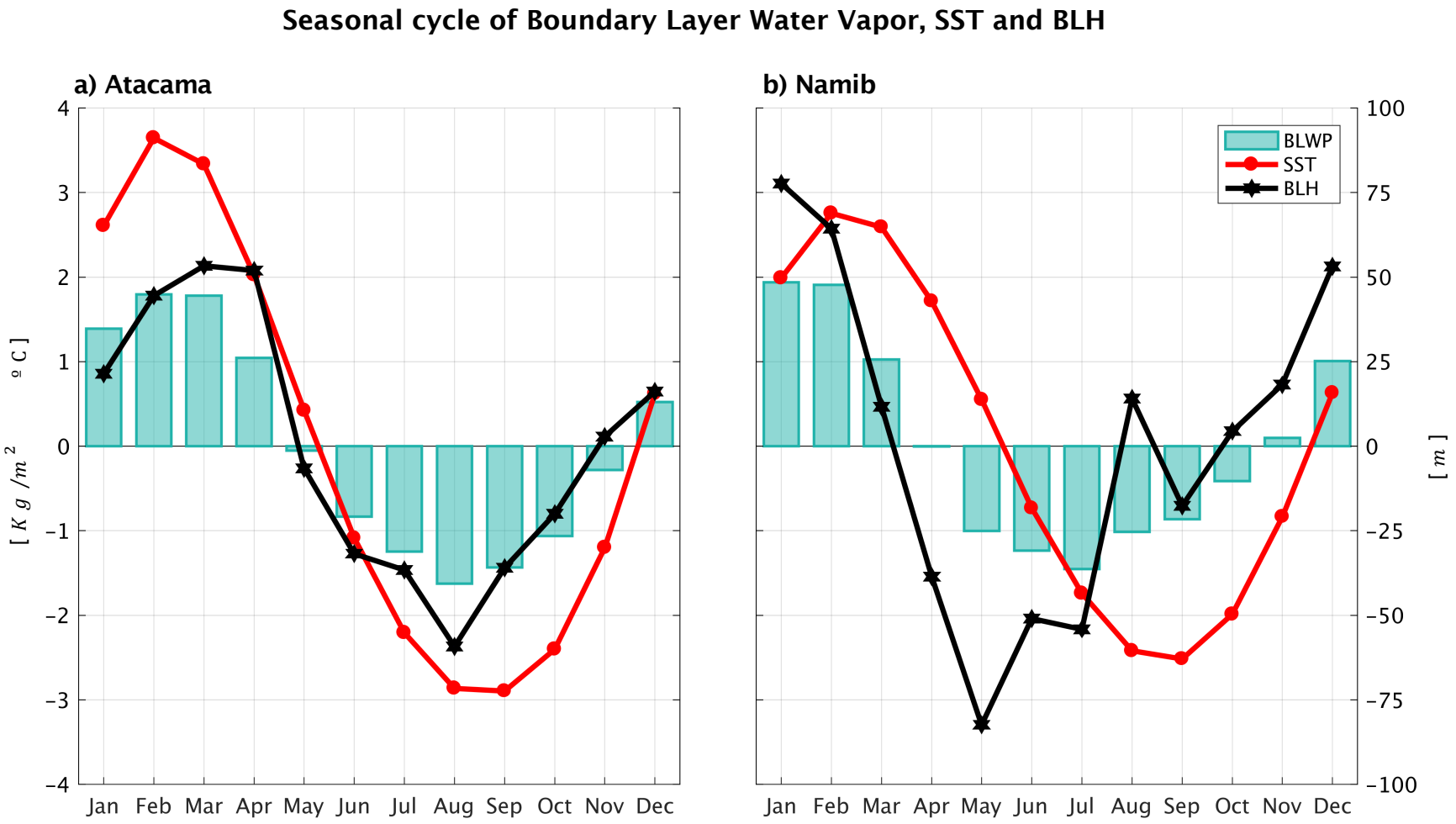




- In the Atacama and Namib, atmospheric humidity decrease from winter to ASO, specially around 900 hPa.
- This is associated with the maximum strength of the subsidence of subtropical anticyclone.
- However, the Namib experiences a strong increment of humidity between 800 an 500 hPa, which overturn the anticyclonic dryness.
- This explain the seasonality of the driest period.

3) BOUNDARY LAYER

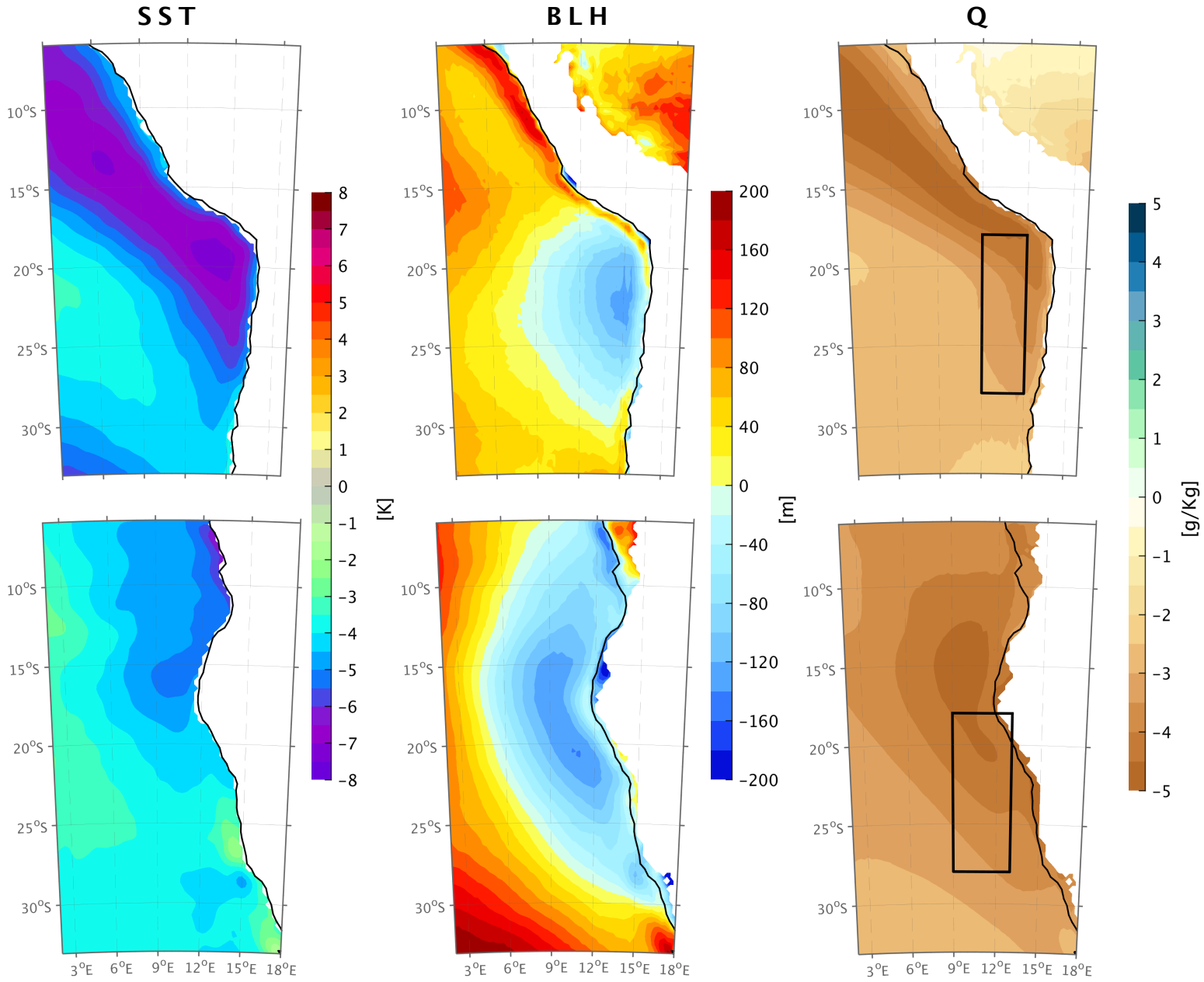


- Several variables could explain water vapor variability.
- Sea surface temperature and boundary layer height.
- In the Atacama, SST and BLH are in phase with the humidity.
- Not the case for the Namib, in which the SST and BLH do not concur.
- Why?

3) BOUNDARY LAYER

- In the Atacama, the presence of a well-mixed MBL produce a strong dependency of the BL water vapor with SST.
- In the Namib, both the SST and BLH play a role into control the water vapor.
- This combined effect is produced by a more stratified MBL, which reduce the effect of the SST in the water vapor seasonal cycle in comparison with the Atacama.
- This shifts the water vapor minimum during the year, between the BL minimum and the SST minimum.

Difference JFM minus JJA (Namib) and ASO (Atacama)



4) SCHEMATIC FIGURE / SUMMARY