



Trapped gravity waves as a dynamic forcing of Pockets of Open Cells (POCS)

Grant Allen, Geraint Vaughan, Paul Connolly, Thomas
Toniazzo et al.

University of Manchester / VOCALS-UK

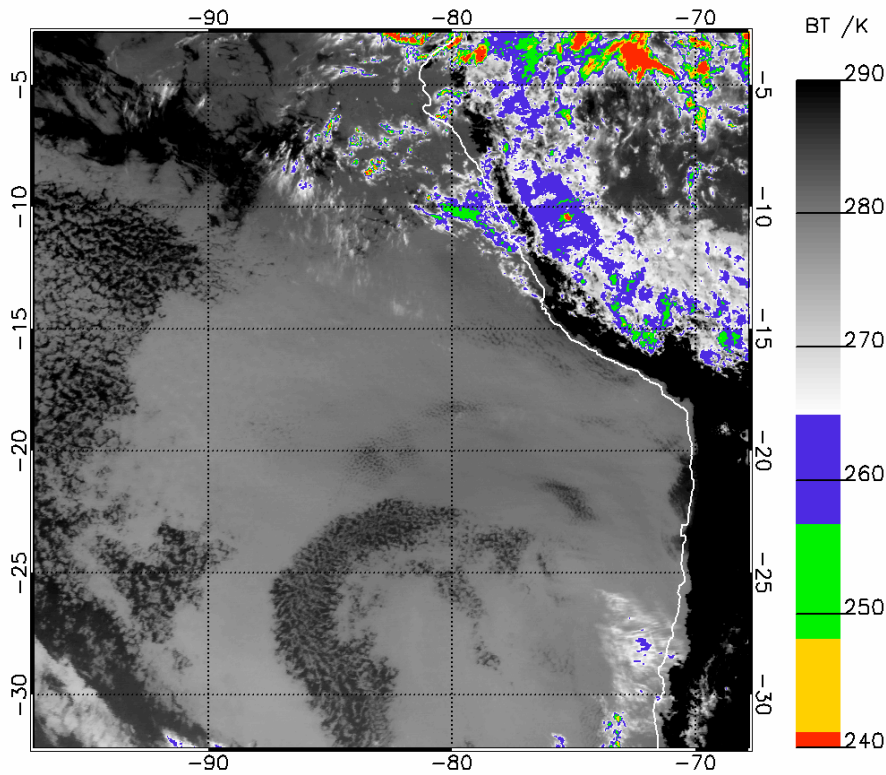
Seattle VOCALS Meeting – 12th July 2009

Trapped Gravity Waves

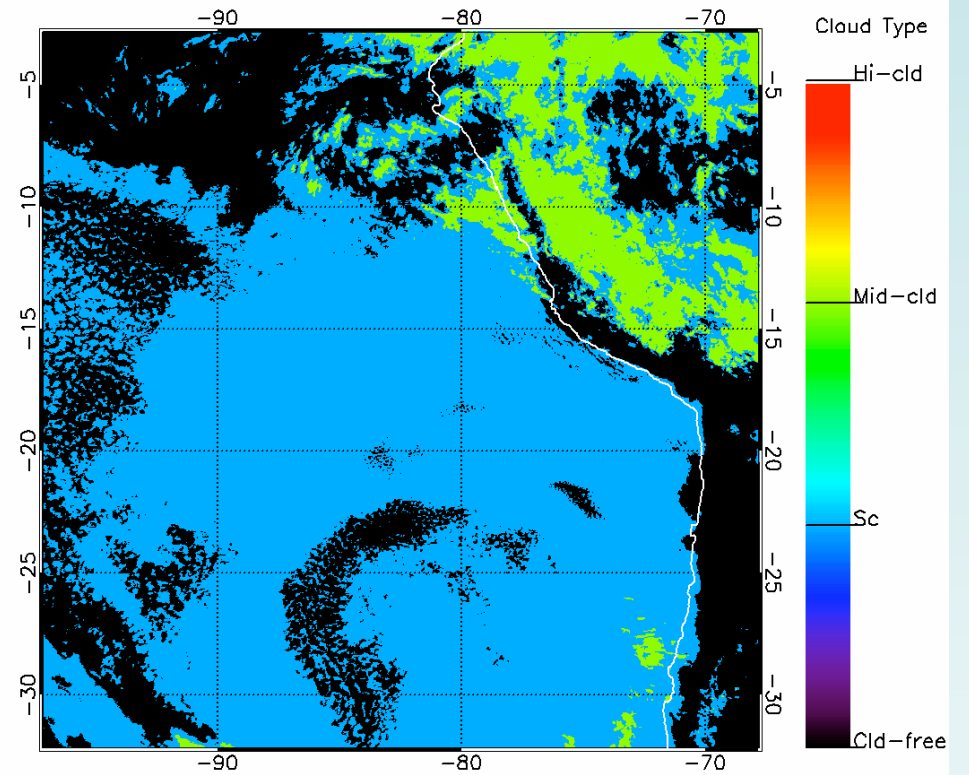
- Could internal gravity waves, trapped by the strong T inversion and wind-shear, provide an initiating mechanism to POCs?
- Gravity waves are observed by satellite on 8th/9th October 2008 and clearly affect the cloud properties over the entire SEP.
- What is the microphysical mechanism?
- What is the carried over signature of the diurnal POC cycle?

Trapped gravity waves

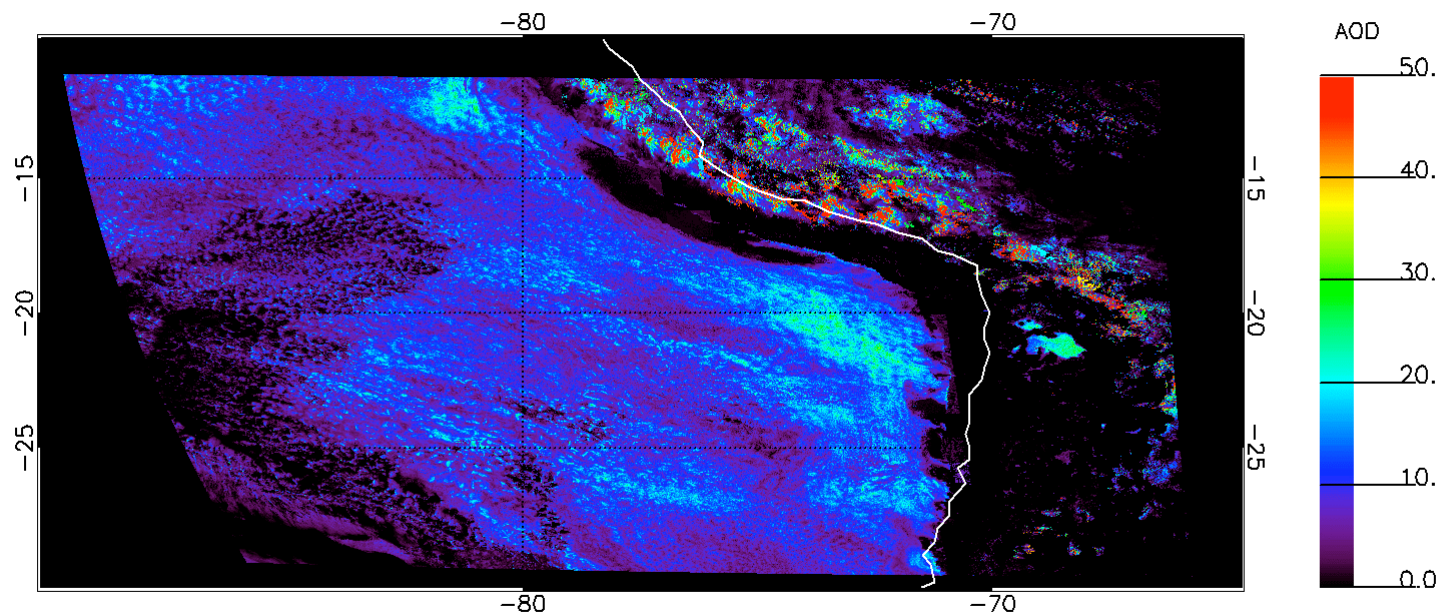
GOES-10 Ch4 200810071358 UTC



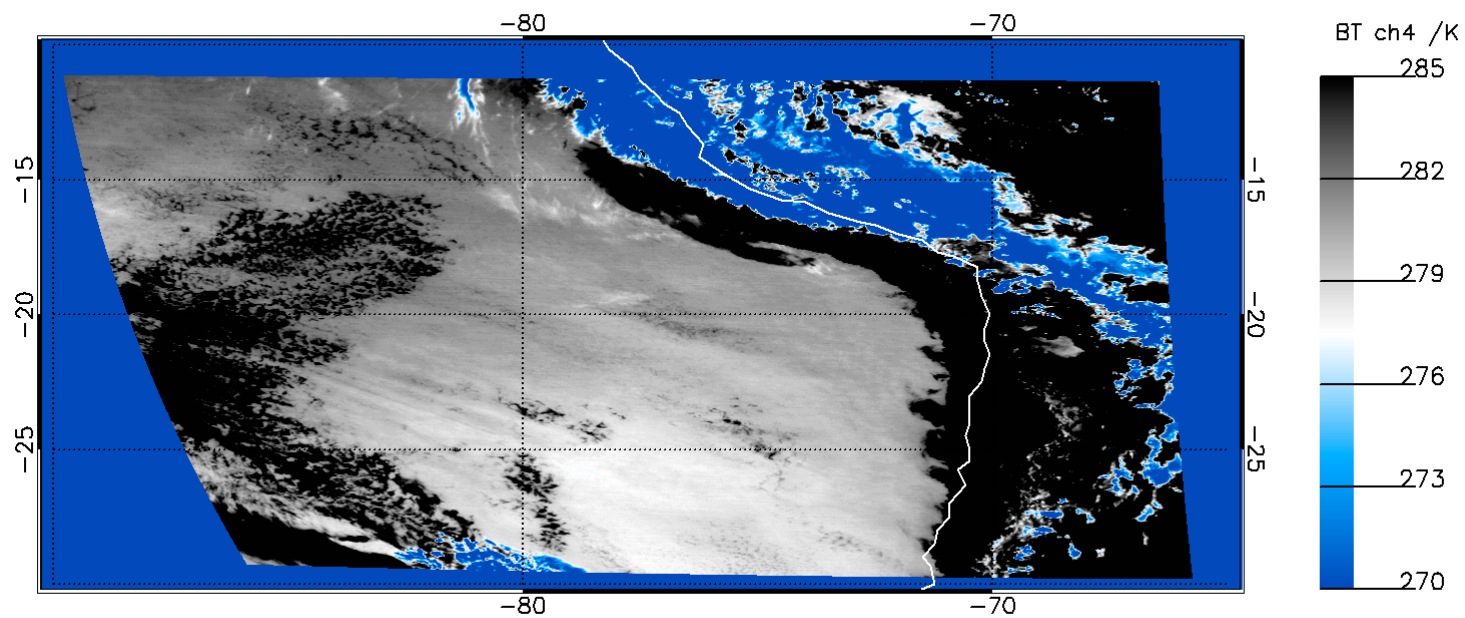
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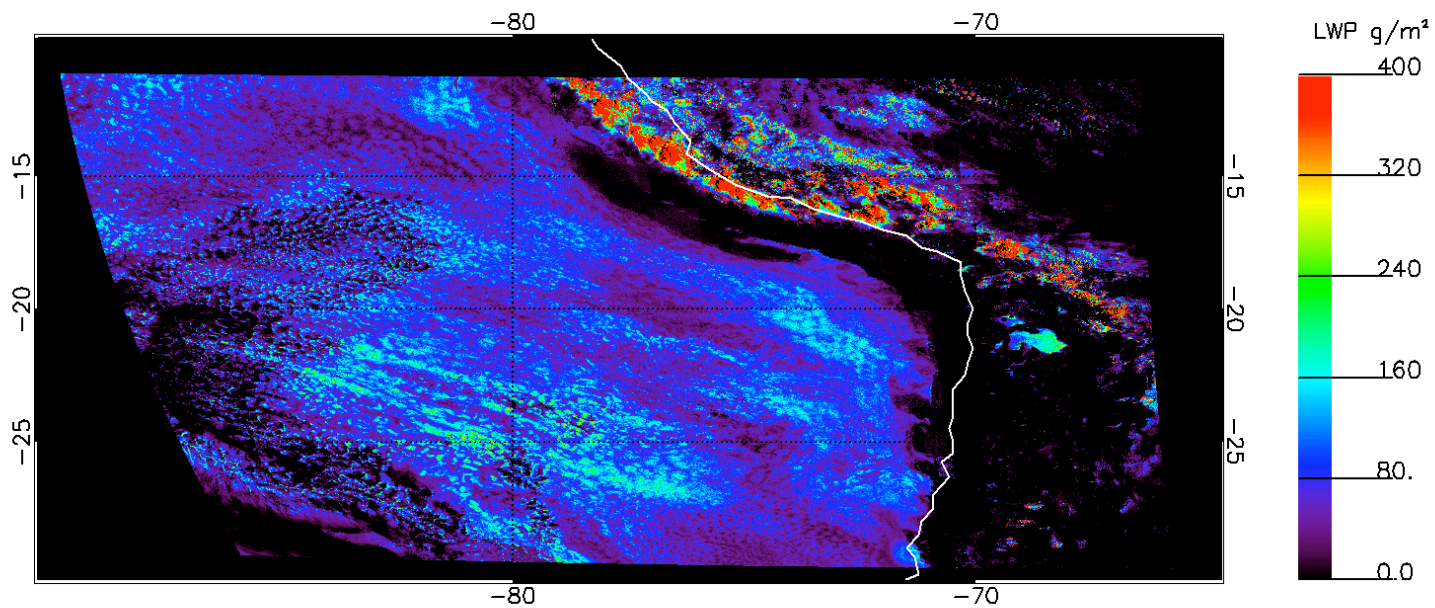
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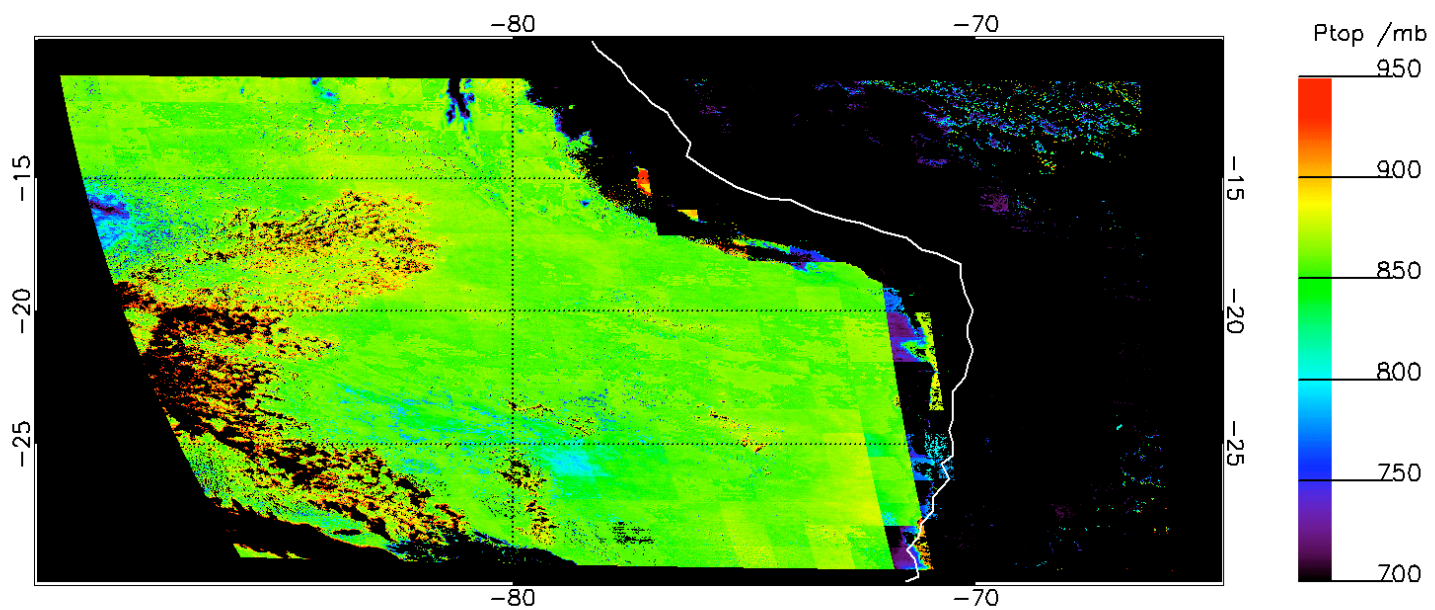
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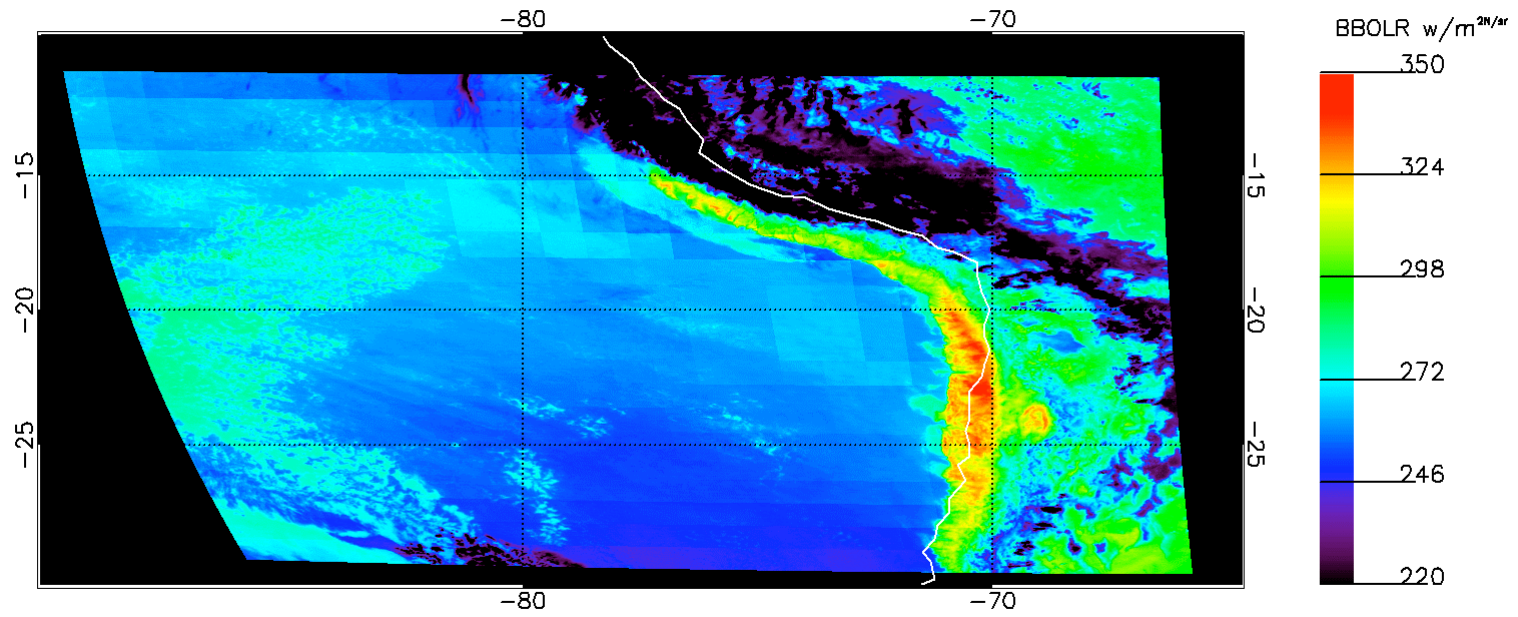
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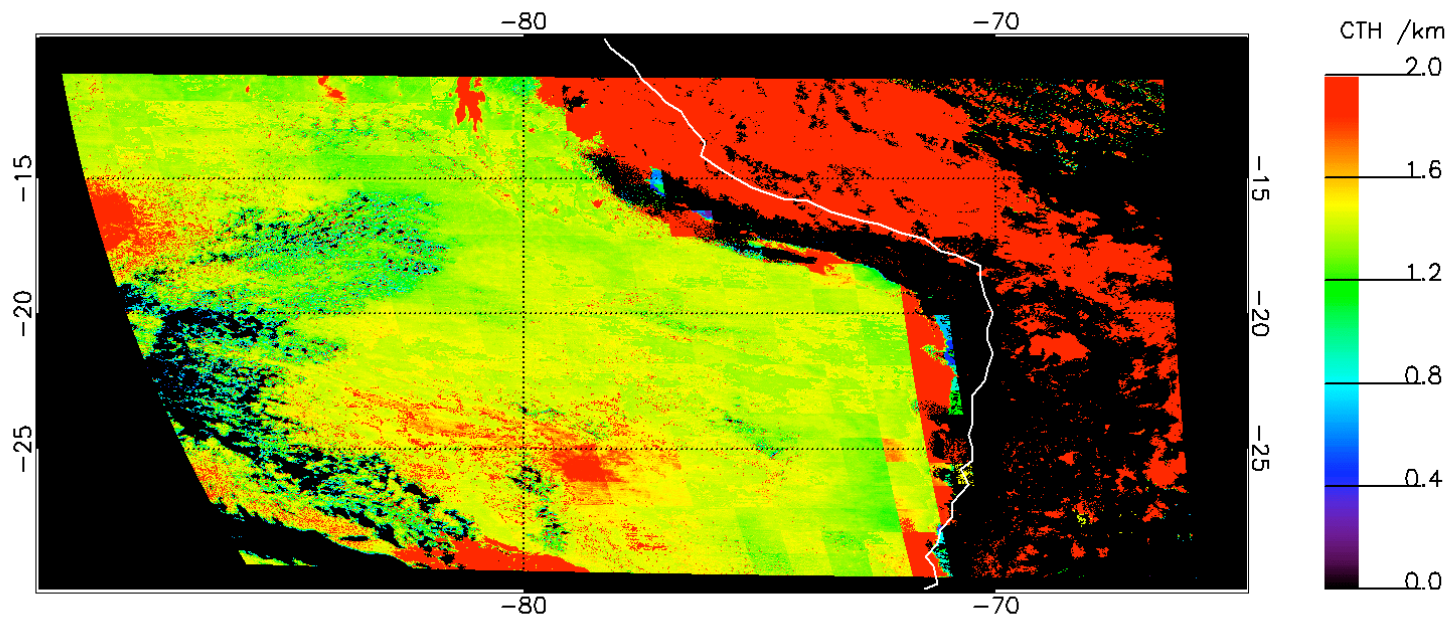
GOES-10 Ptop 200810082045 UTC



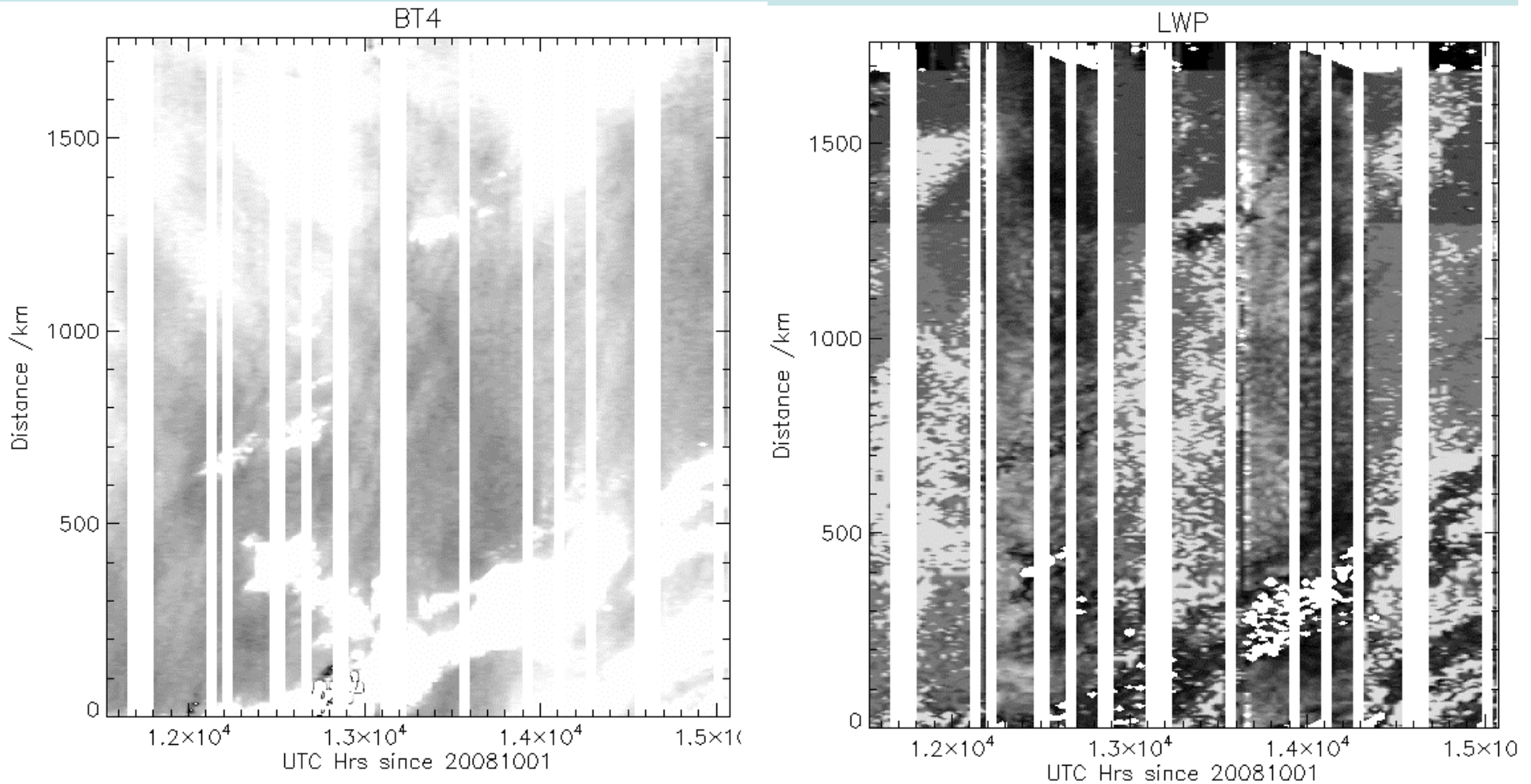
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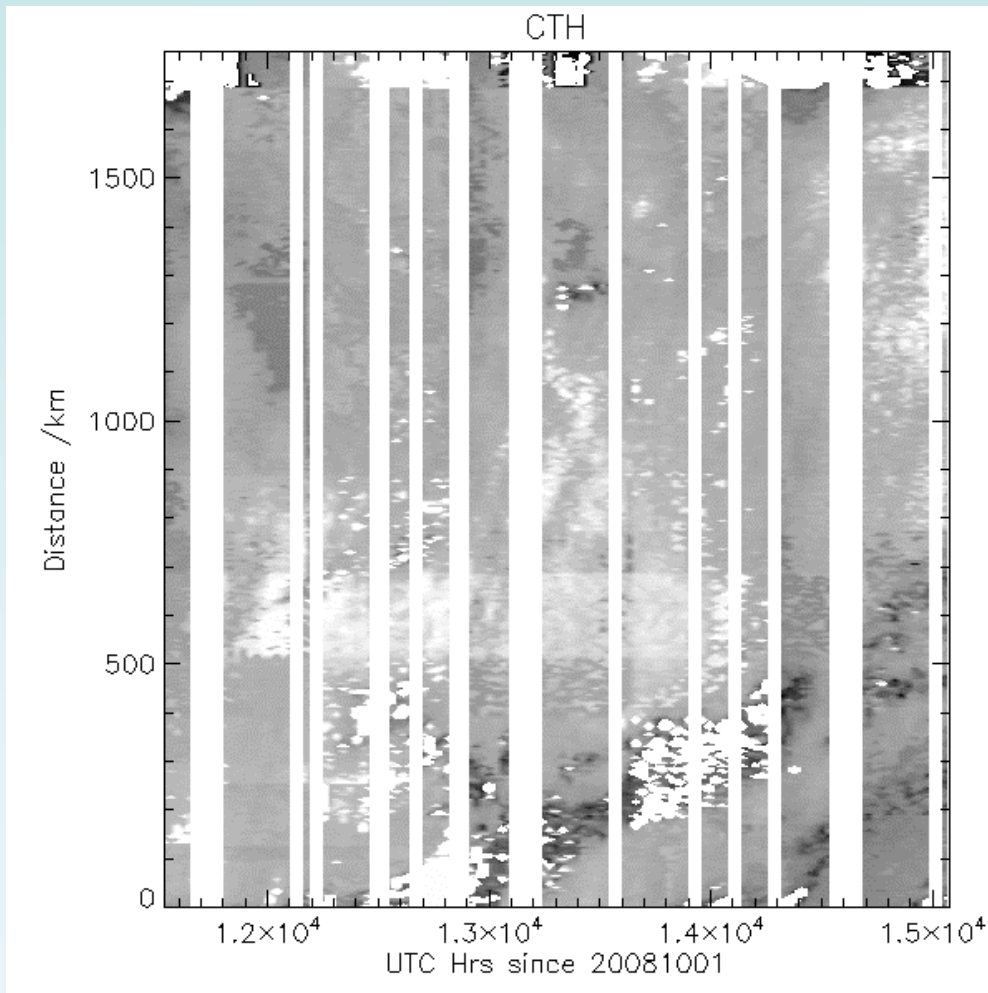


Hovmoller Plots of Ch4 BT and LWP



- **Continuous, coherent propagation for 1500 km!**
- **60 km/hr phase speed ; ~60 minute period peak-to-peak**

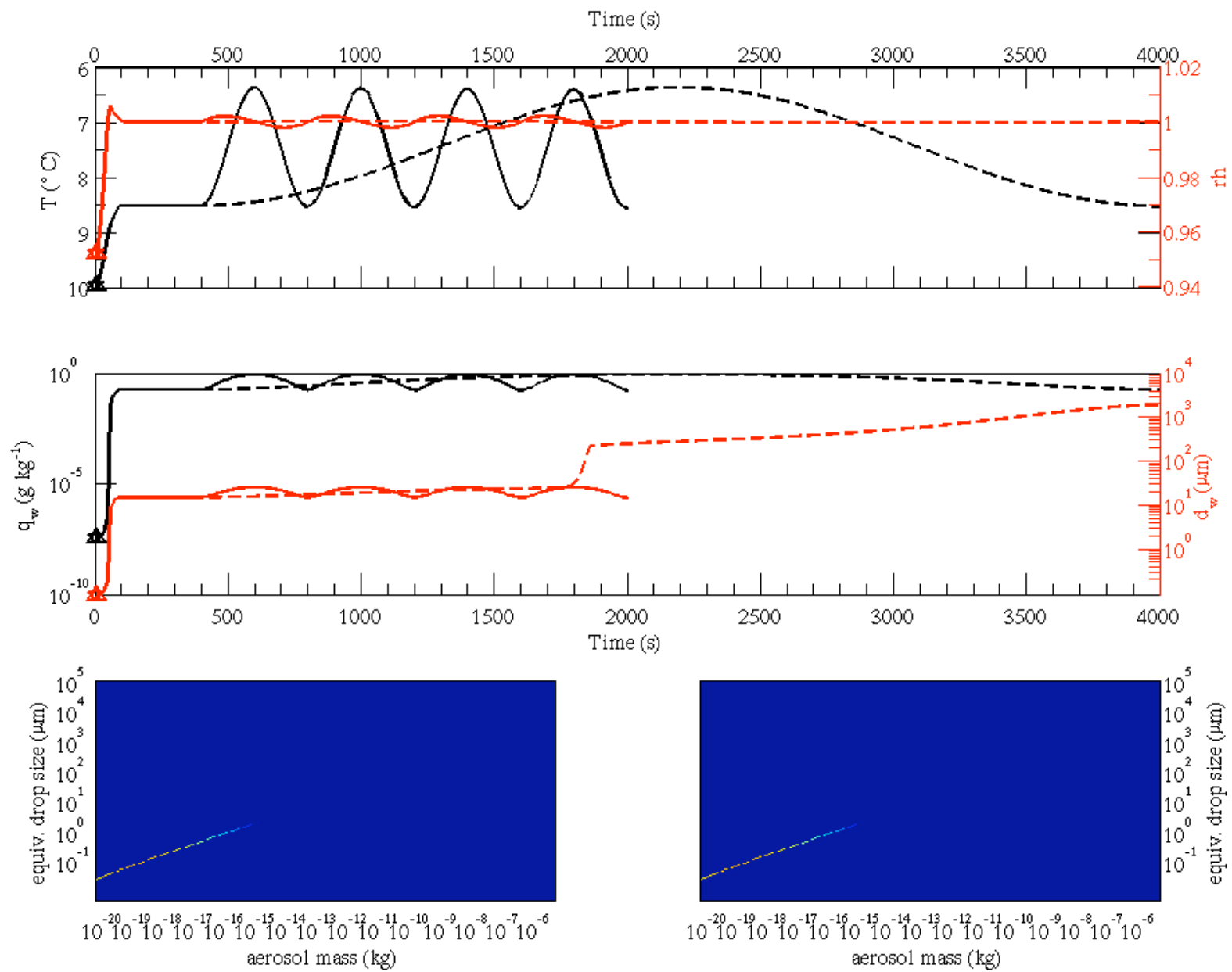
Physical mechanisms

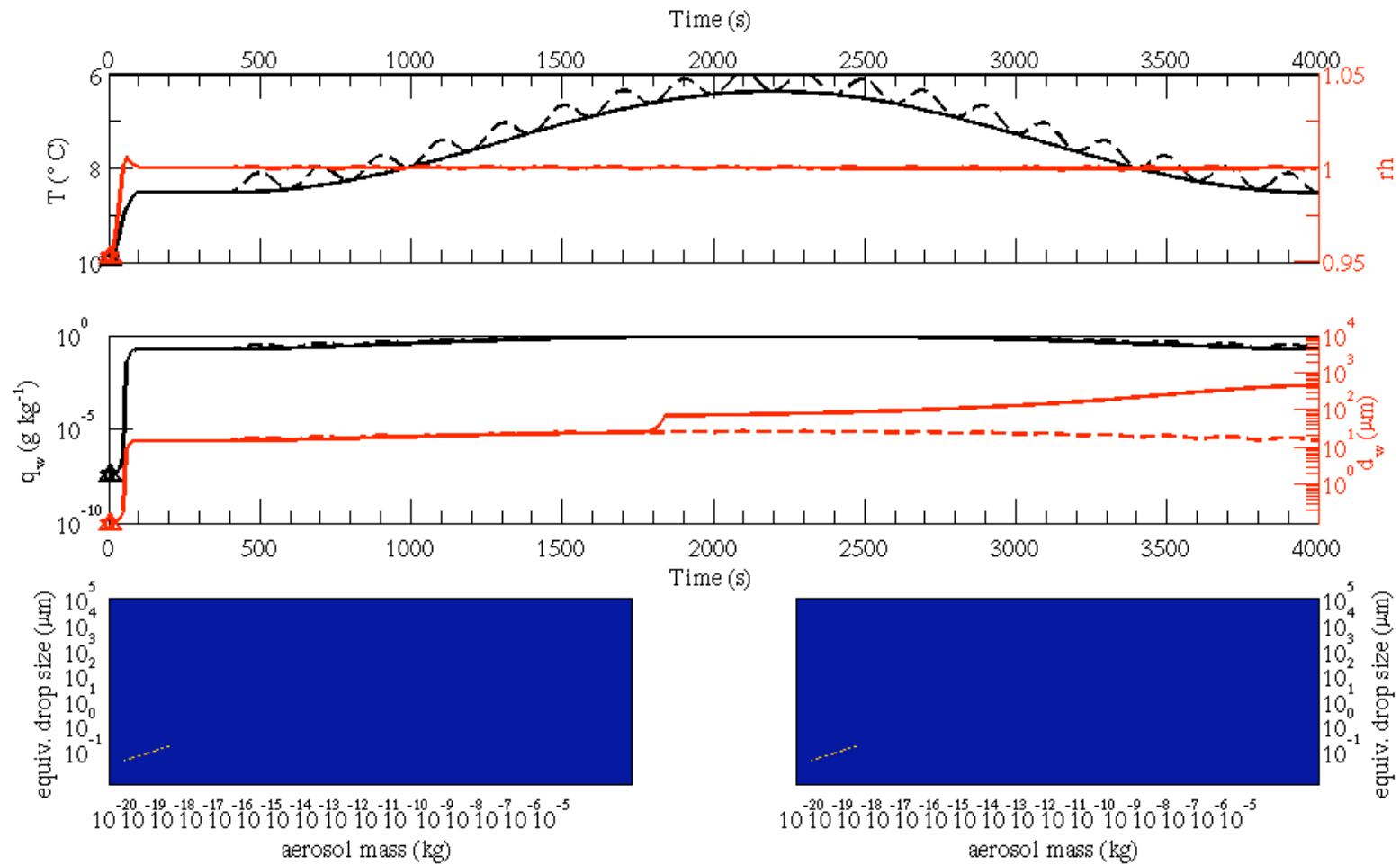


Gravity waves also perturb cloud top height

Could these modifications in cloud bulk properties lead to intense drizzle such that CCN are scavenged such that the POC opens?

Clearly, cloud tops are higher along the crest of the waves, LWP is increased hence more likely drizzle.





Gravity wave summary

- Gravity waves are triggered throughout October in a synoptic convective disturbance near 30 S, 95 W.
- These waves are trapped along the MBL and are evident as north-eastward propagating coherent wave-trains in cloud brightness temperature indicating an undulating cloud top height and LWP
- These waves propagate perpendicular to the mean south easterly flow
- On occasion, POCS form in the troughs of these waves, which subsequently advect with the mean flow and follow the usual diurnal POC cycle.
- The effect on cloud field is more marked as they approach the coast with evidence of wave reflection off the sharp topography.
- Gravity waves are not seen during the flying period and so do not appear to be a ubiquitous and necessary dynamic for POC formation.

Gravity waves - Further work

- Investigate nature of the disturbance in the sub-tropics and identify mechanism for gravity wave generation – Rossby wave?
- Quantify POC cloud-cleared area as a result of the propagating waves
- Look for evidence of an undulating inversion height in aircraft data in late October.