Gravity Wave Hunting

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IDEAS-III Flight #rf01
A very preliminary look at 8/19/03 data and how I might use this data to look for atmospheric gravity waves triggered by convection

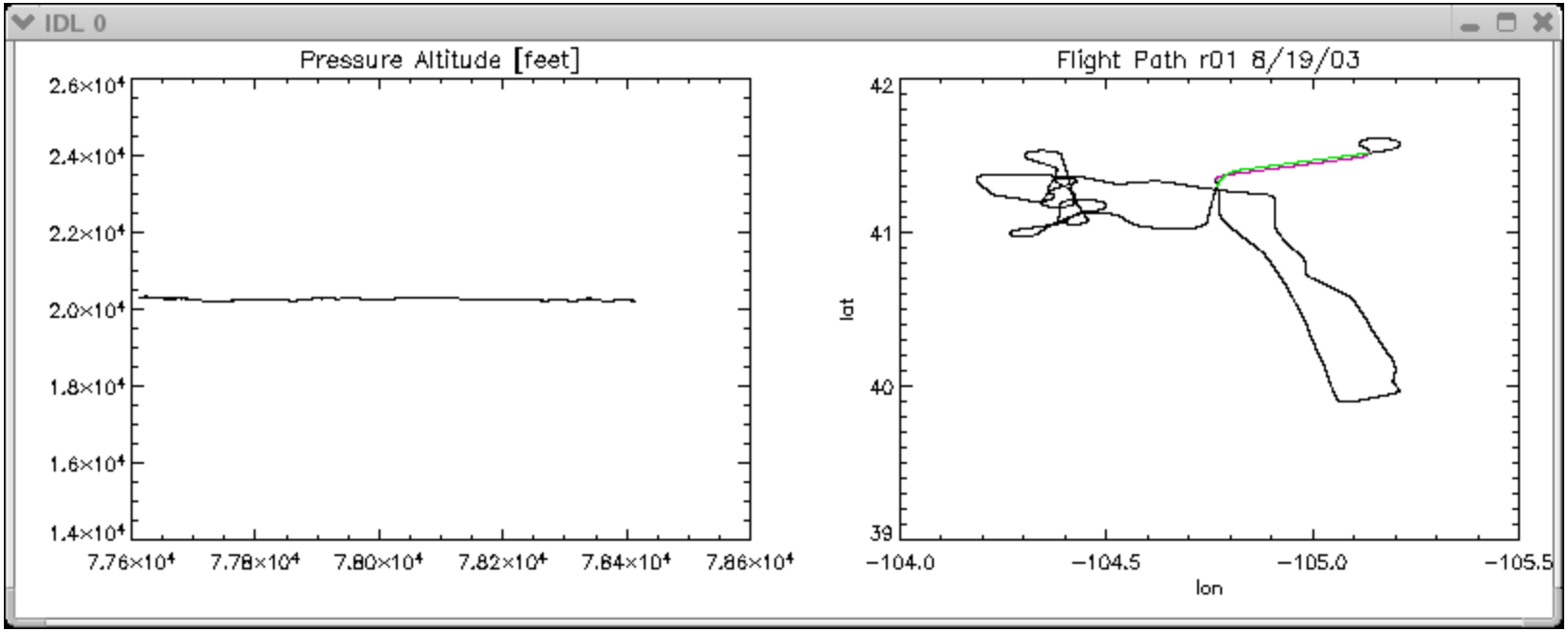
Very Quickly About…

- Gravity wave is excited as the response of the atmosphere to convective heating
- Gravity wave is disturbance that can be observed by action of gravity on density variation in a stratified atmosphere. I.e. look at pressure perturbations:

$$p' = \hat{p}\sin(kx - wt)$$

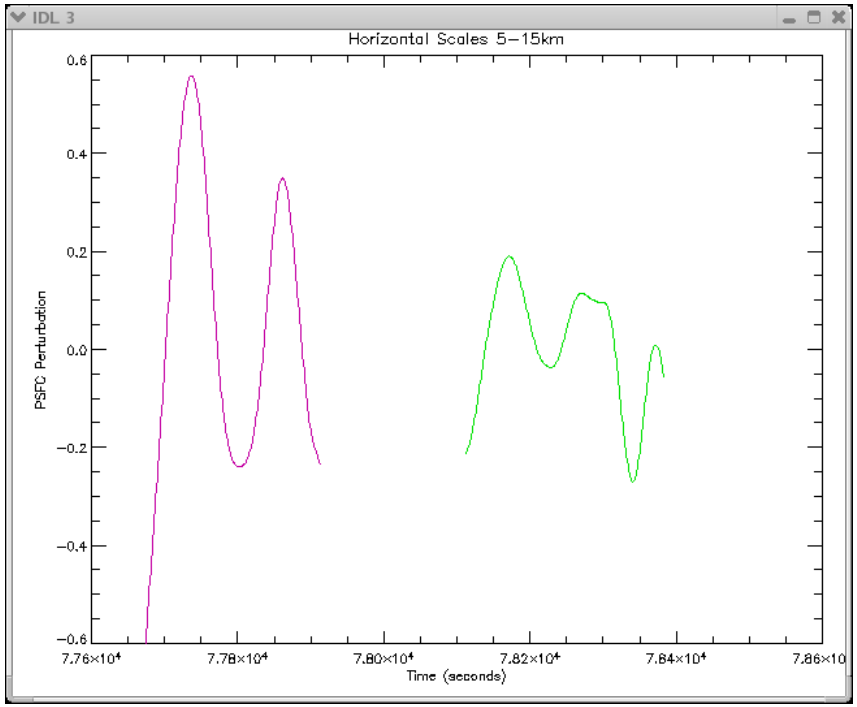
- Horizontal Scales of 10-100km
- Short periods of <1 day
- Have been observed to propagate upstream of convective cells

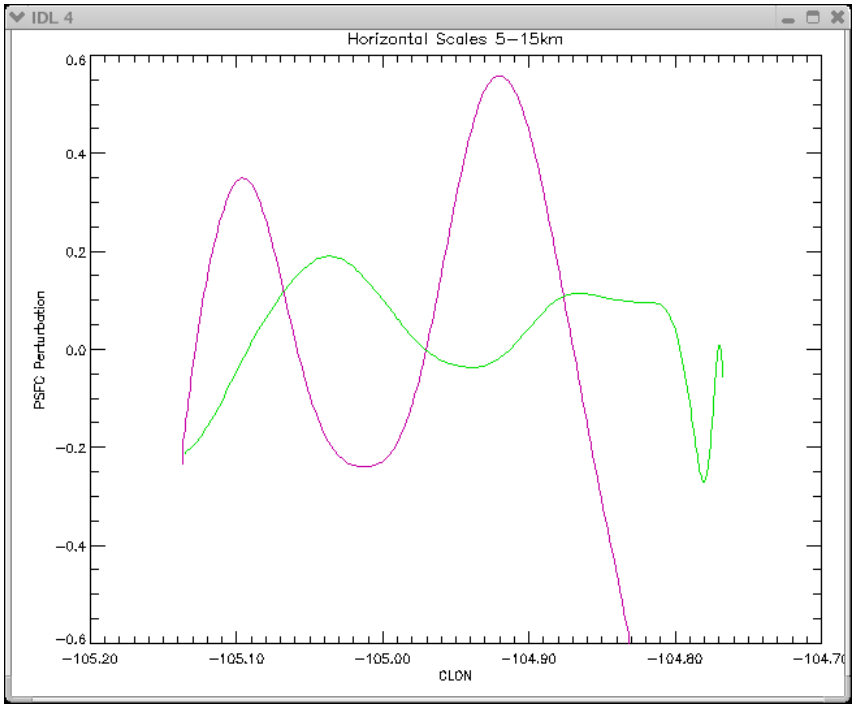
Where I looked…



- Constant altitude (~20,000 feet)
- “straight shot” and longer path (21:31:39 to 21:46:40)
  - horizontal wavelengths of atmospheric gravity waves have been observed to be 10-100km
  - (~56 km long passed over twice)
- Best case – heading into or out of a cloud with or against horizontal wind
  - Convection GWs have been observed to occur upstream of convection
  - (Not this time)

Is it a Gravity Wave?





- Subtract background value from observation to reveal pressure perturbations (smoothed to show horizontal wave scales of 5-15km)
- 100 seconds crest to crest (mean aircraft speed ~142m/s during this section) = ~14km peak to peak wave
- The wave appears to have shifted ¼ wavelength in 425 seconds, propagating eastward at ~8m/s or propagation westward at ~25m/s
- Amplitude has appeared to decrease
- Is it really a wave? I don't know. [Pressure measurement ERROR=+/-0.3mb?]
- Need to pay more attention to what else is going on and look at a few different altitudes and longer paths.
- Compare to other parameters that can be used to look for gravity waves i.e temperature and winds