

Evolution of the MBL as observed with the P3DWL using nadir stares

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WG meeting, Boulder, CO
August 2011

Objectives

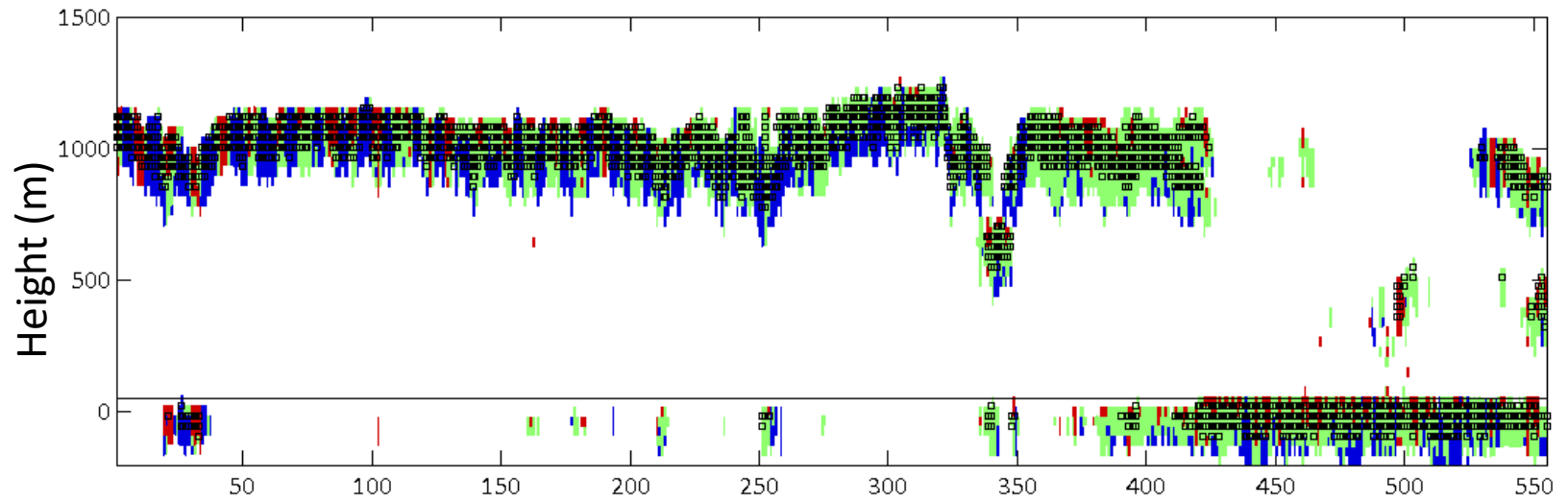
- Understand relationship between waves (swell) and OLEs
- Map vertical coherence in vertical velocities
- OLEs in the presence of LLJs
- Develop cloud porosity statistics

MBL evolution and organization

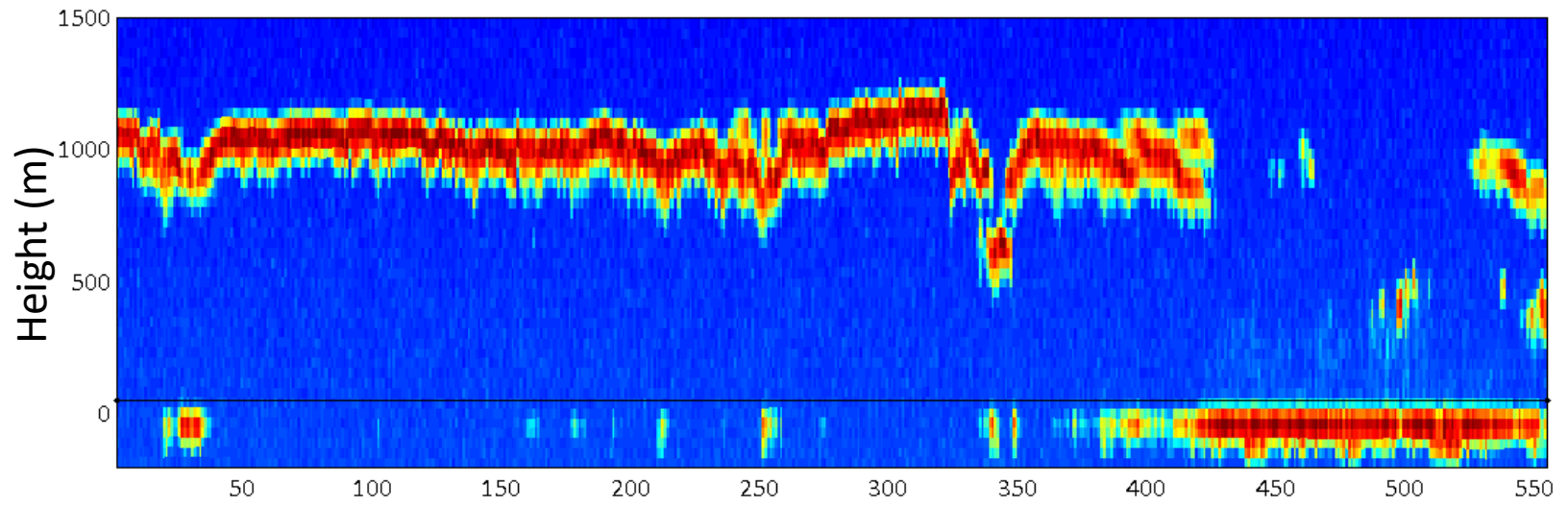
- The following are examples of nadir (vertical velocity only) sampling between Hawaii and the West Coast on 8 October, 2008.
- The top panel shows the vertical velocity as a function of height (m) and horizontal distance (1 unit = 25 meters)
- The bottom panel shows the signal return strength

Google earth track

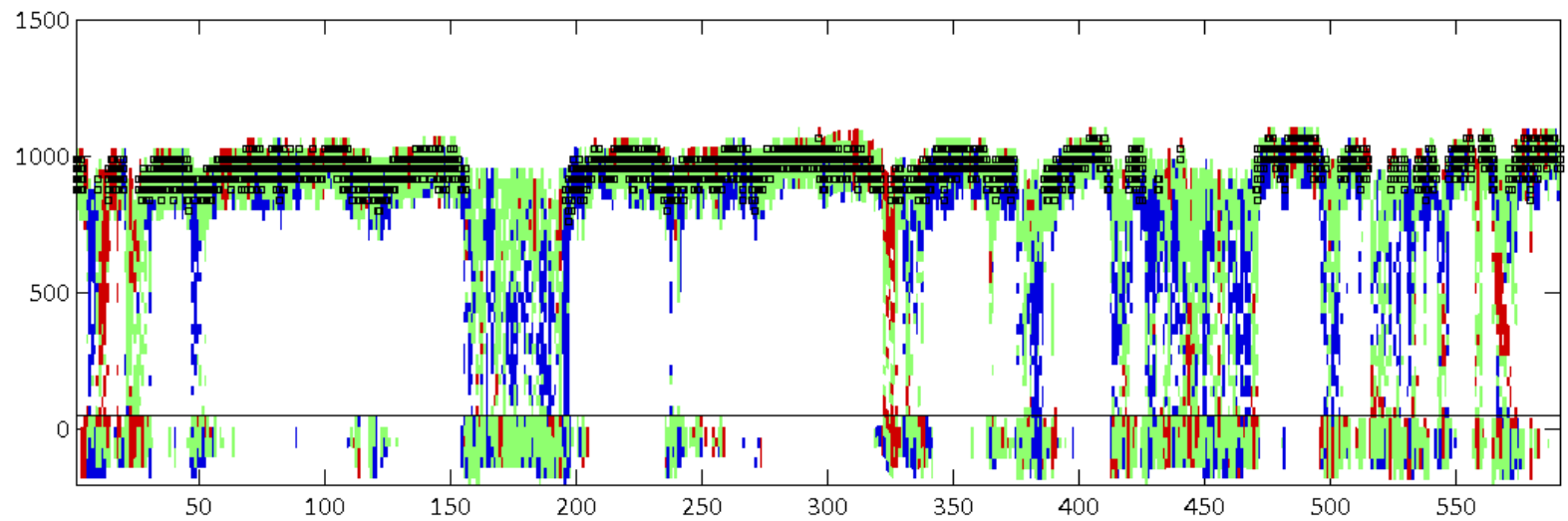
VLOS 204114



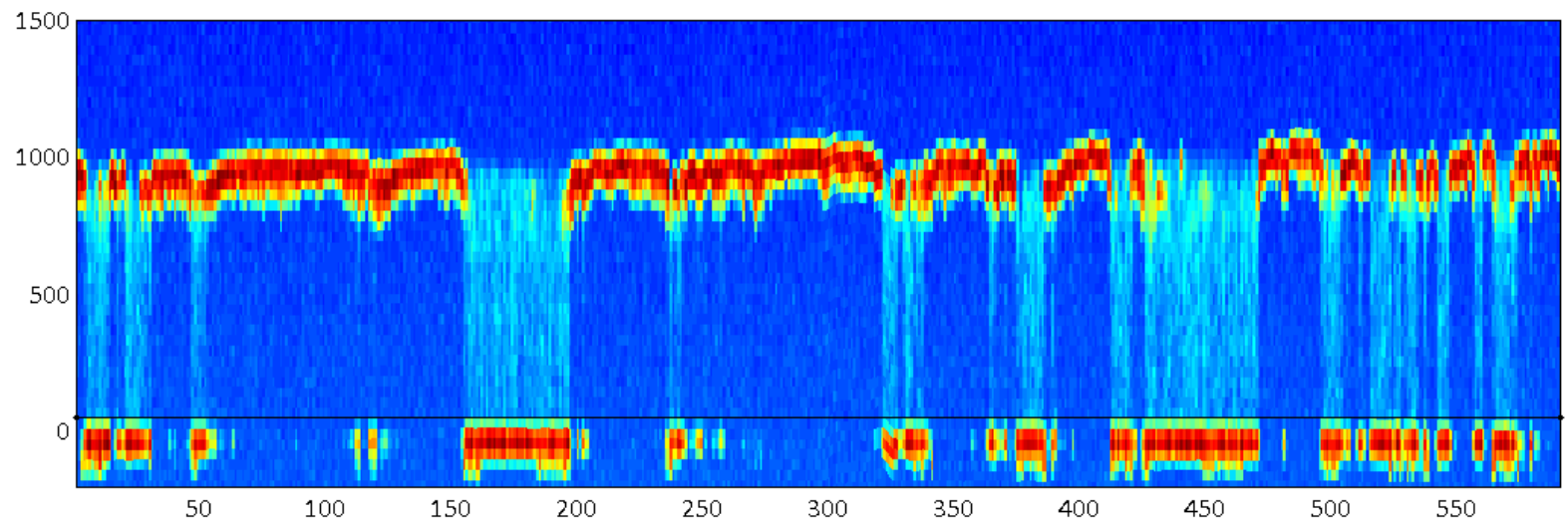
14 km
SNR



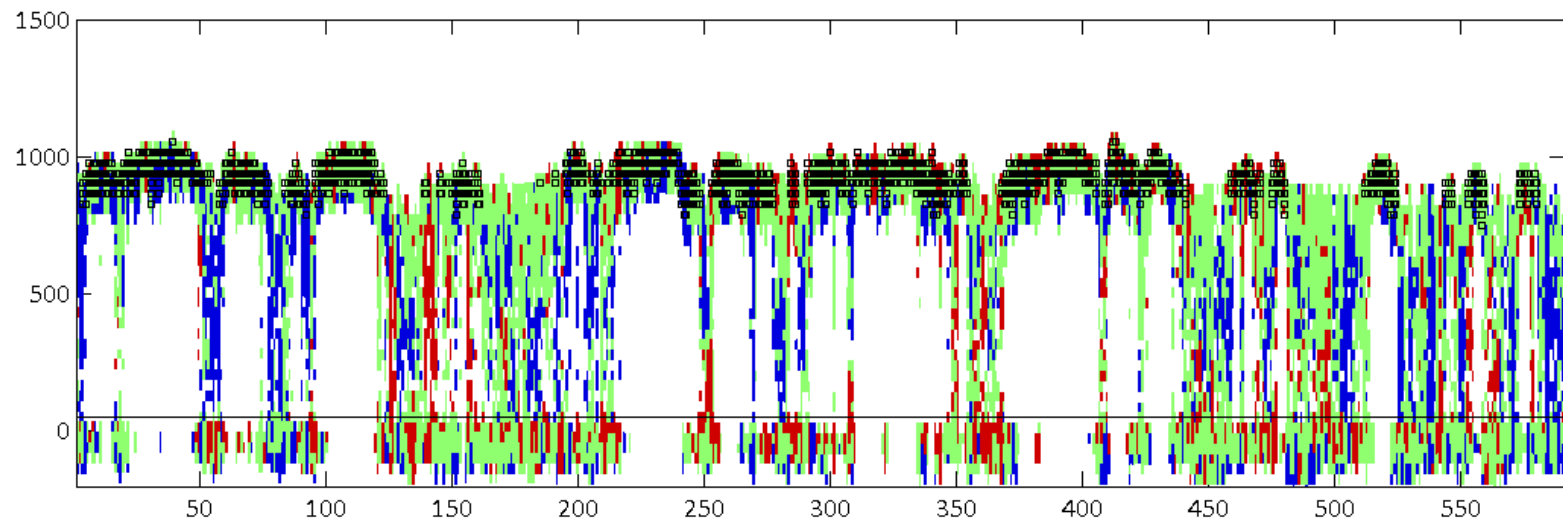
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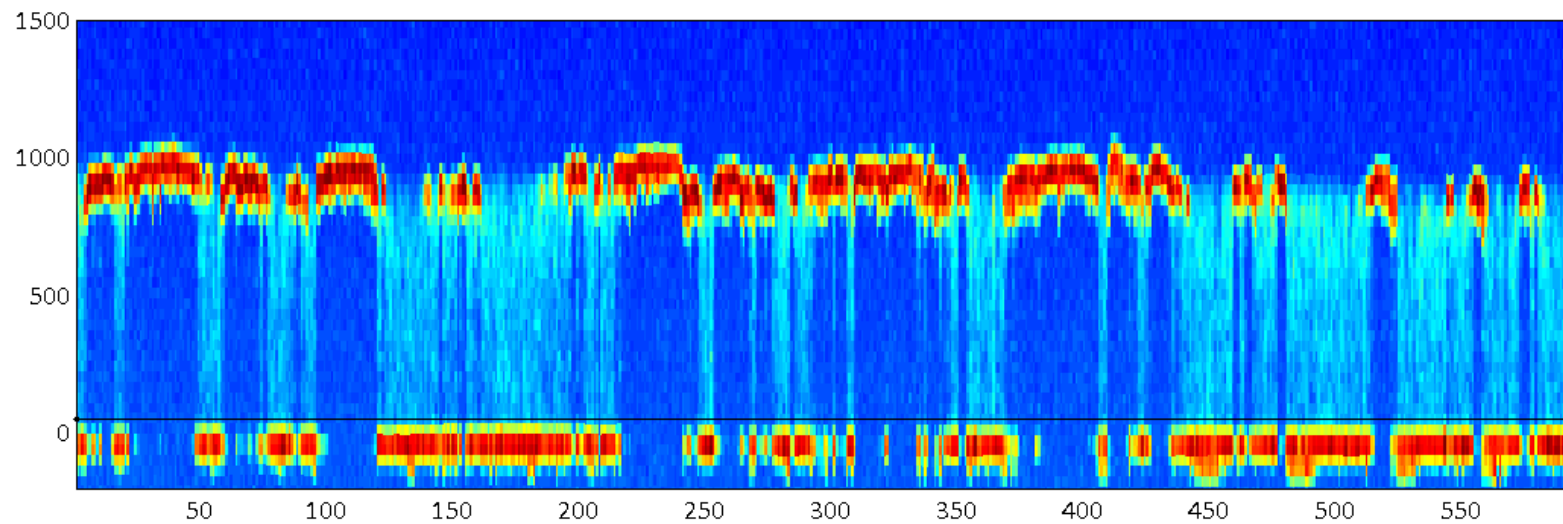
SNR



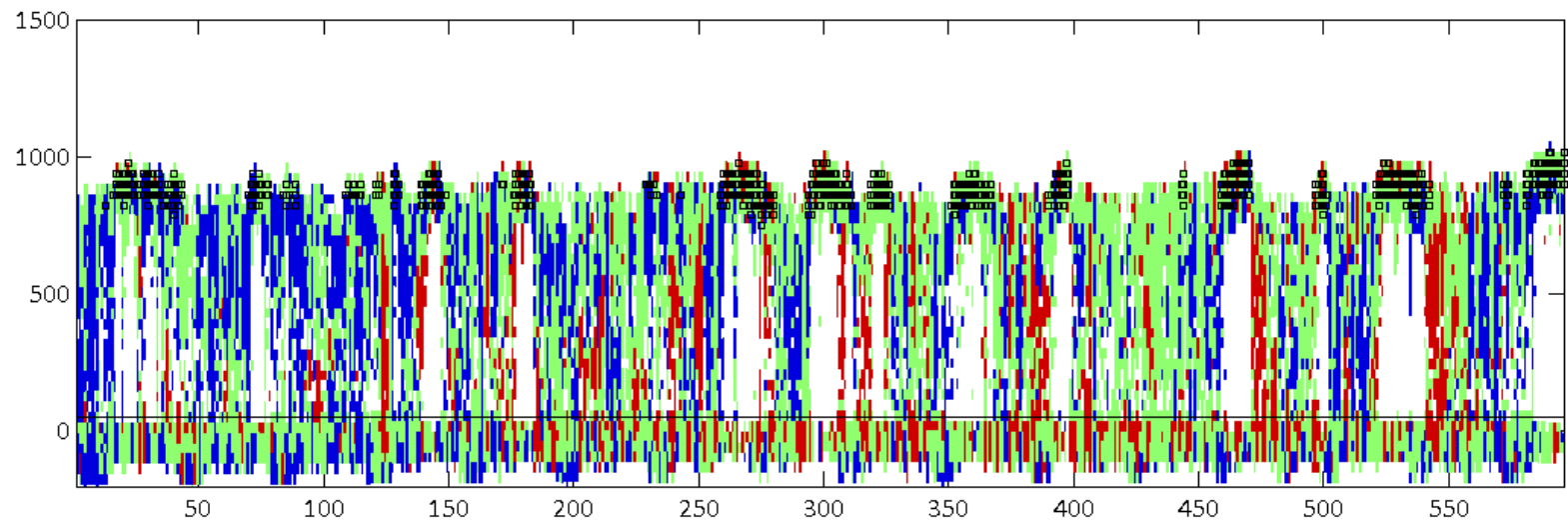
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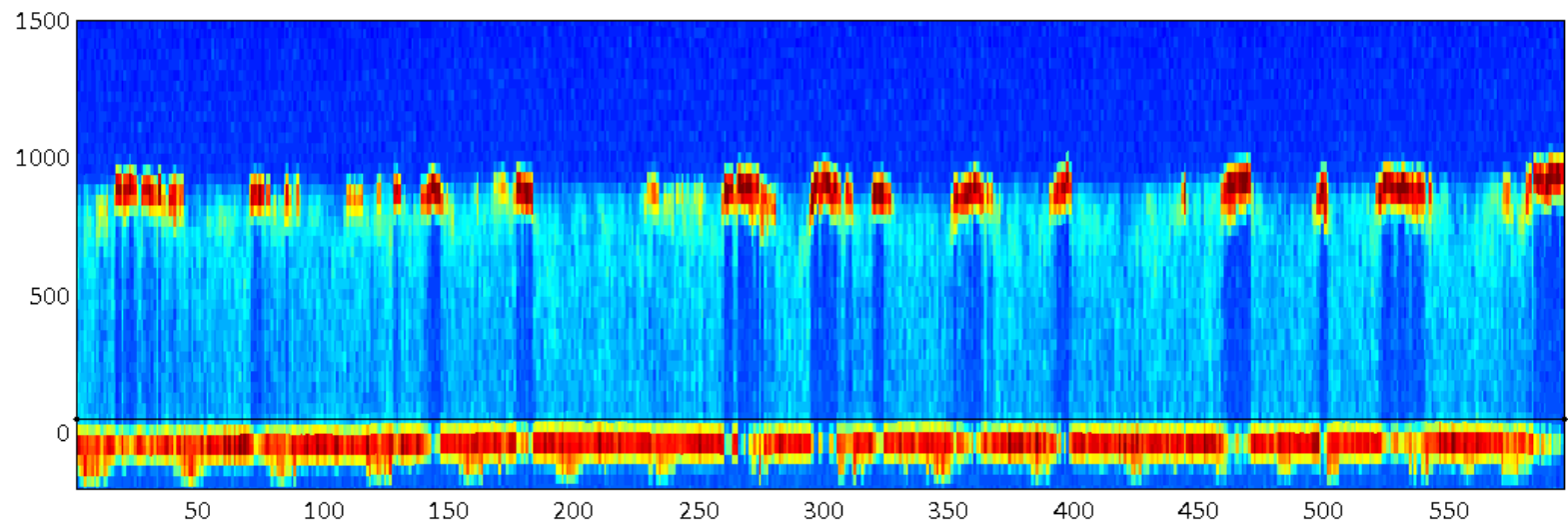
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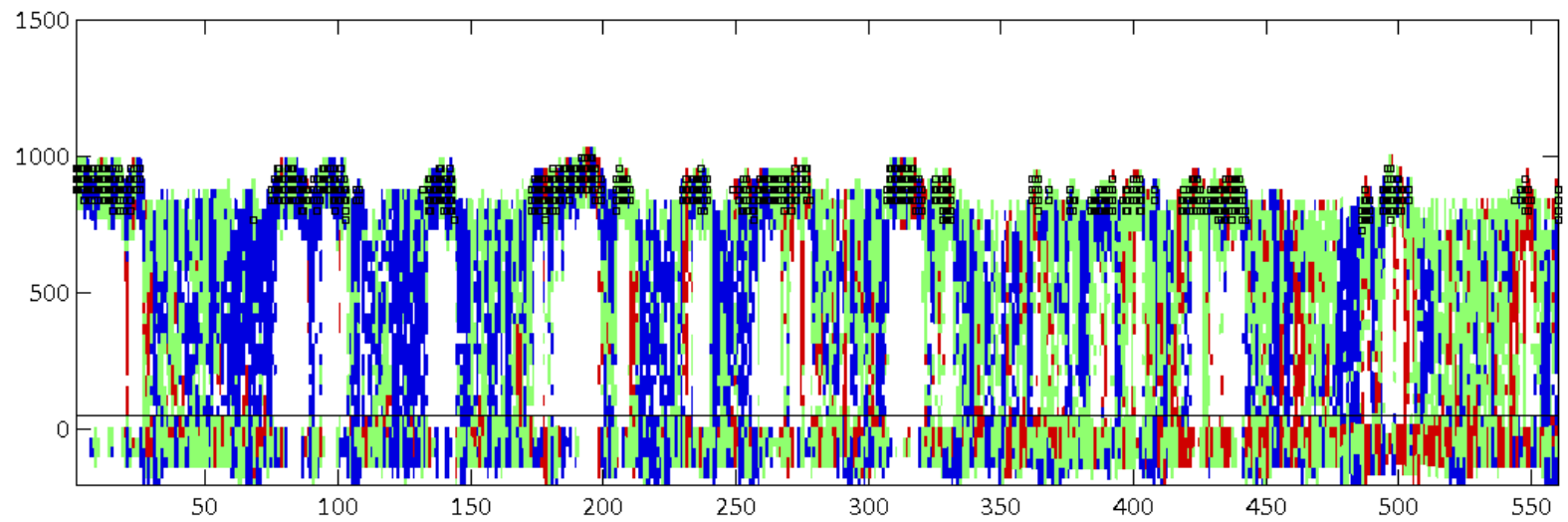
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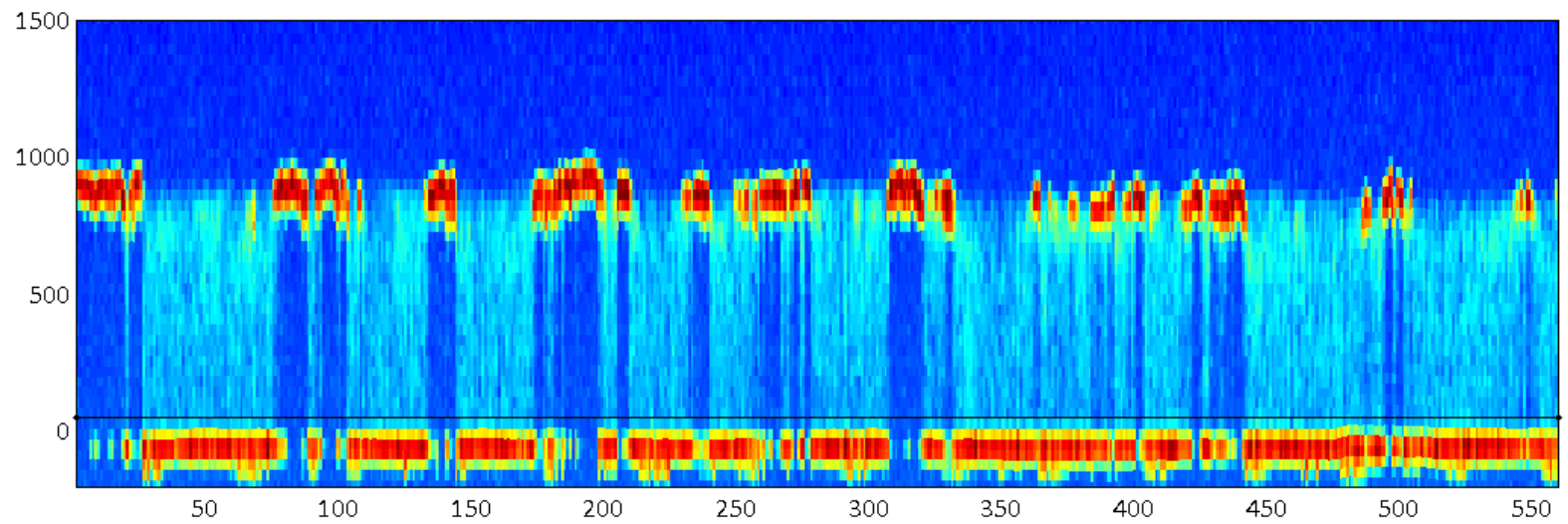
SNR



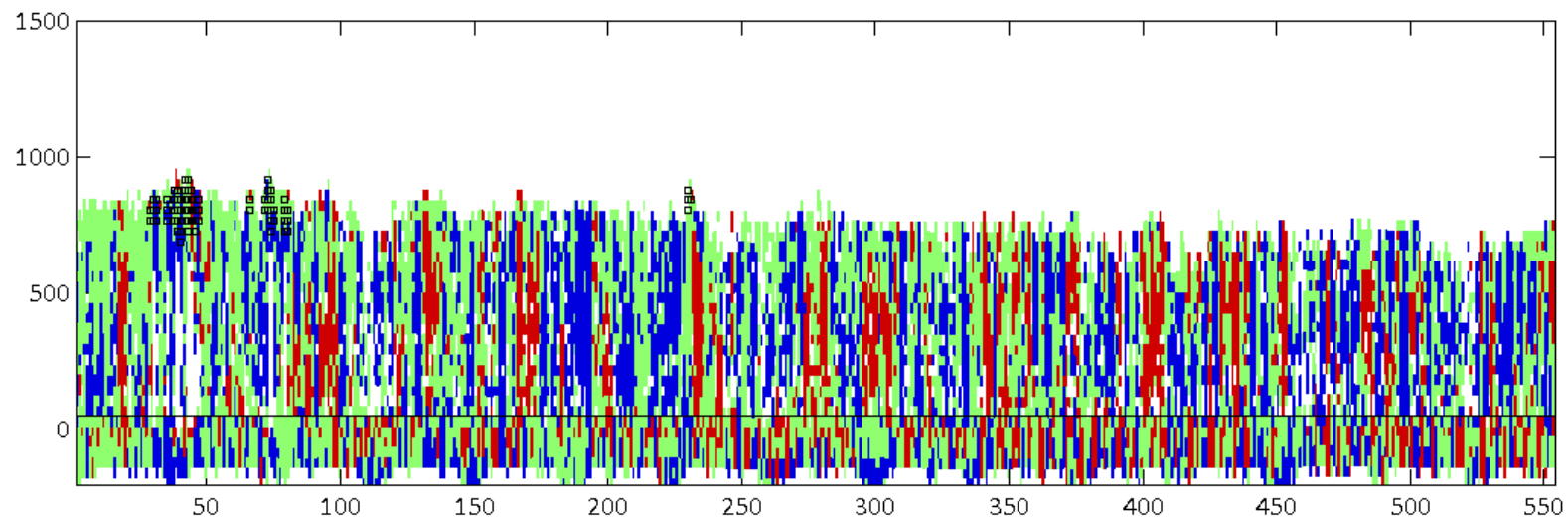
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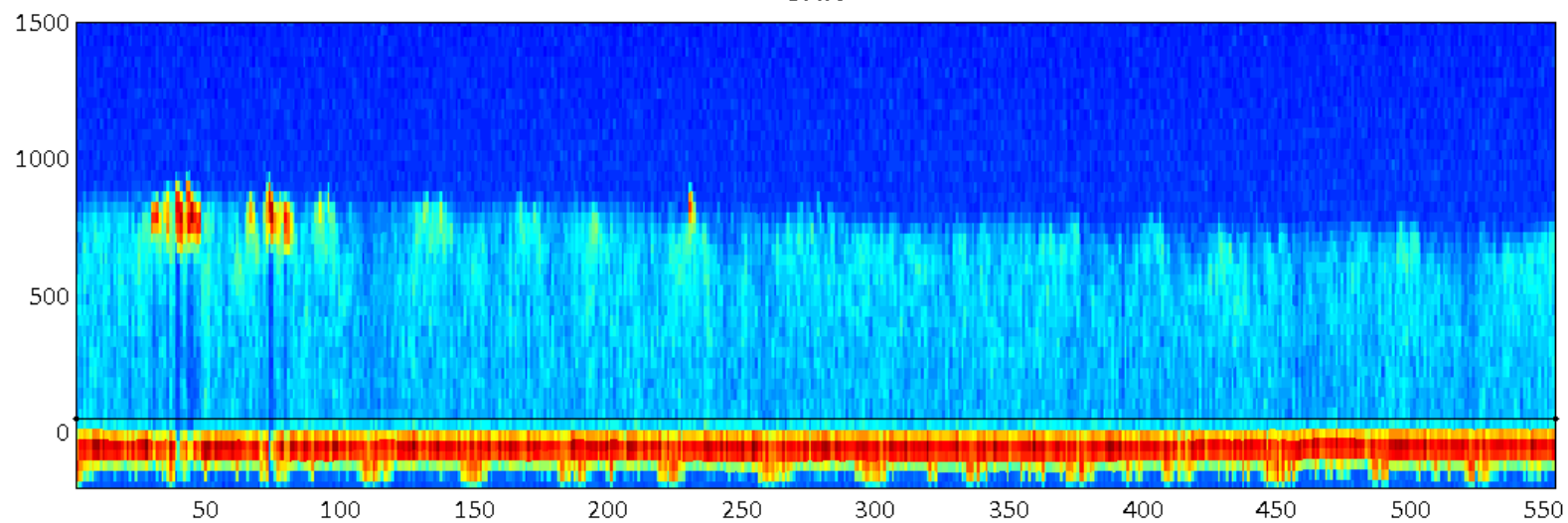
SNR



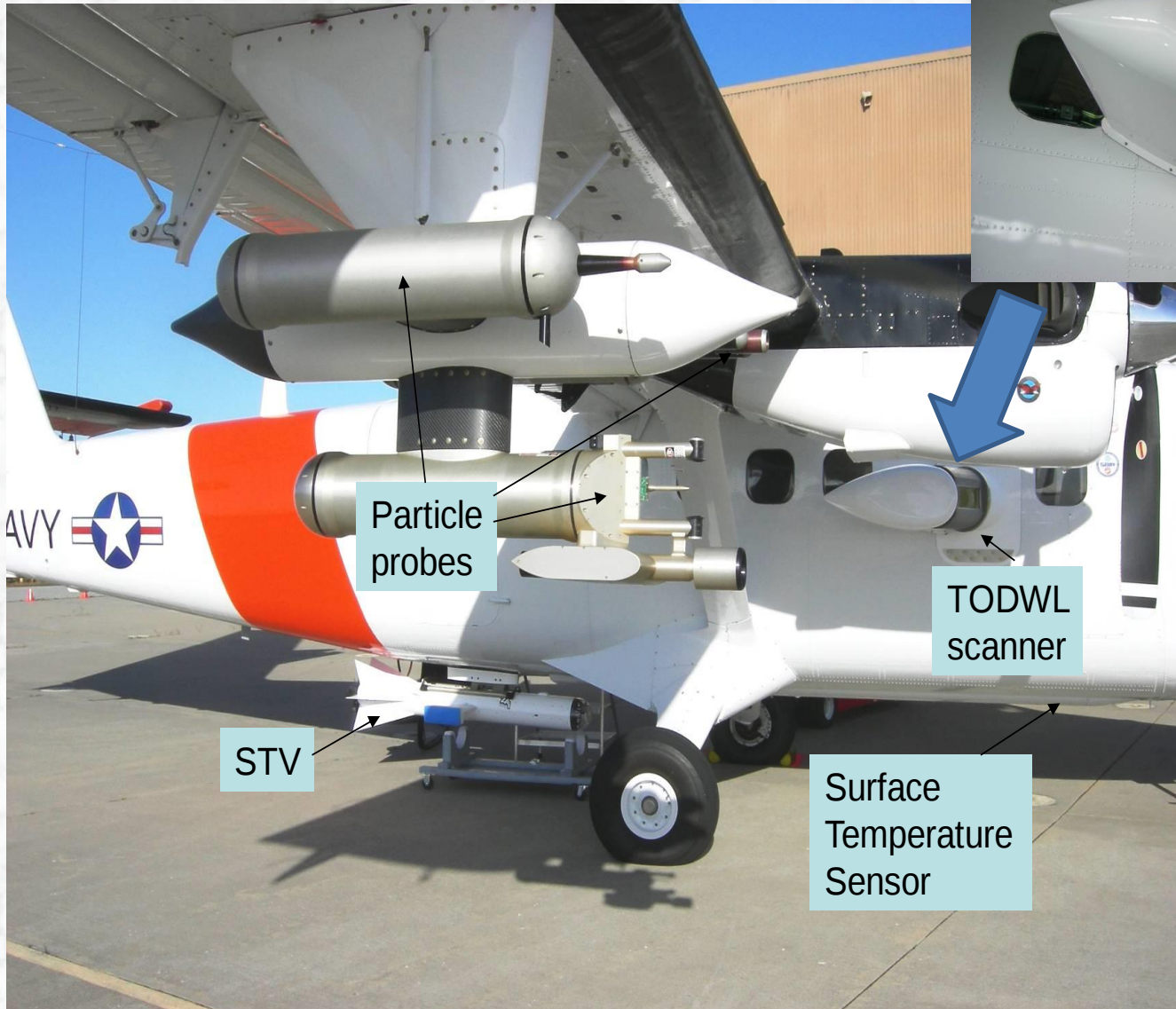
VLOS 221235



SNR



Interesting MBL structures off California Coast



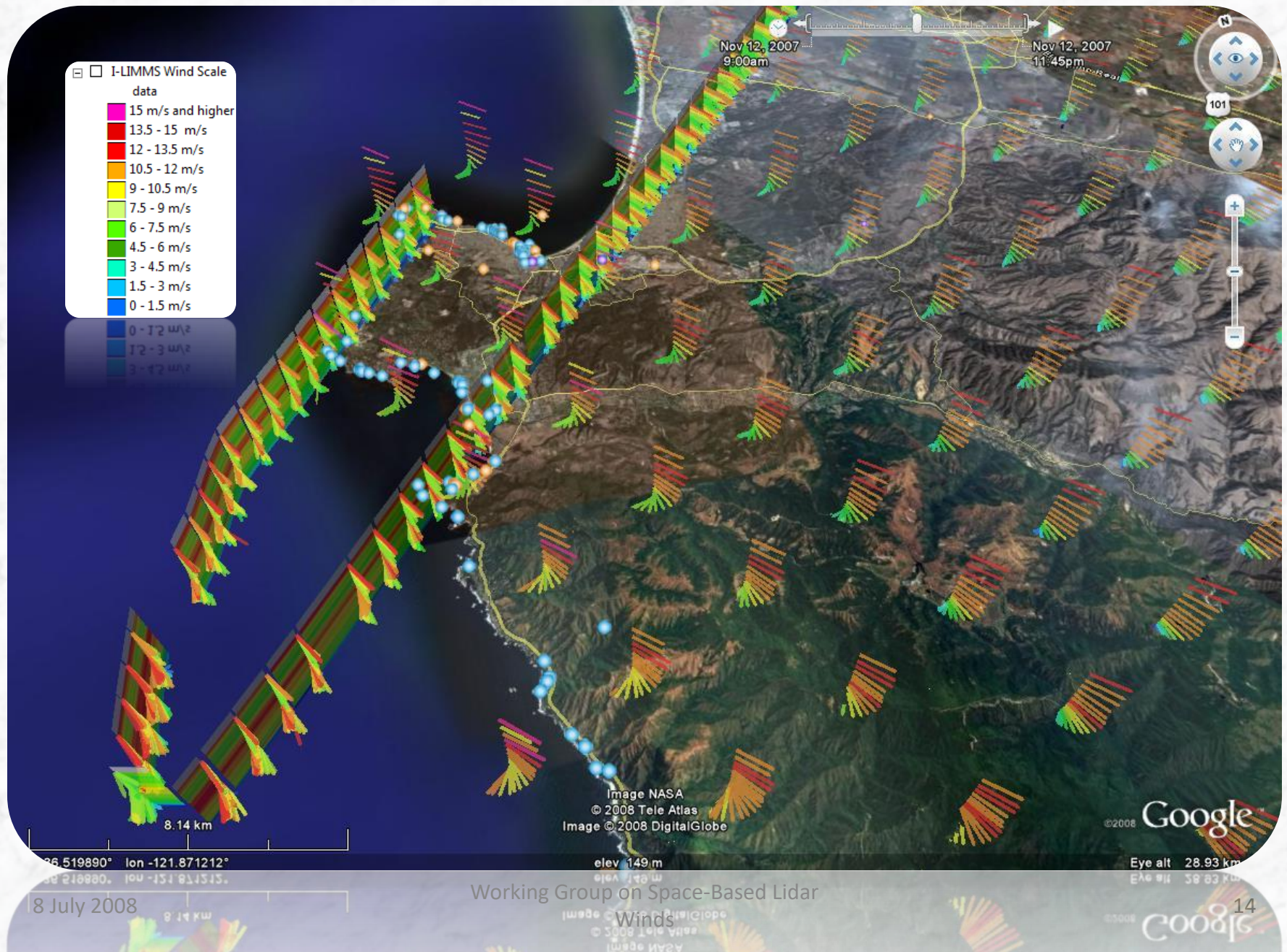
TODWL

Twin Otter Doppler Wind Lidar

Example of P3DWL “curtain” of wind profiles

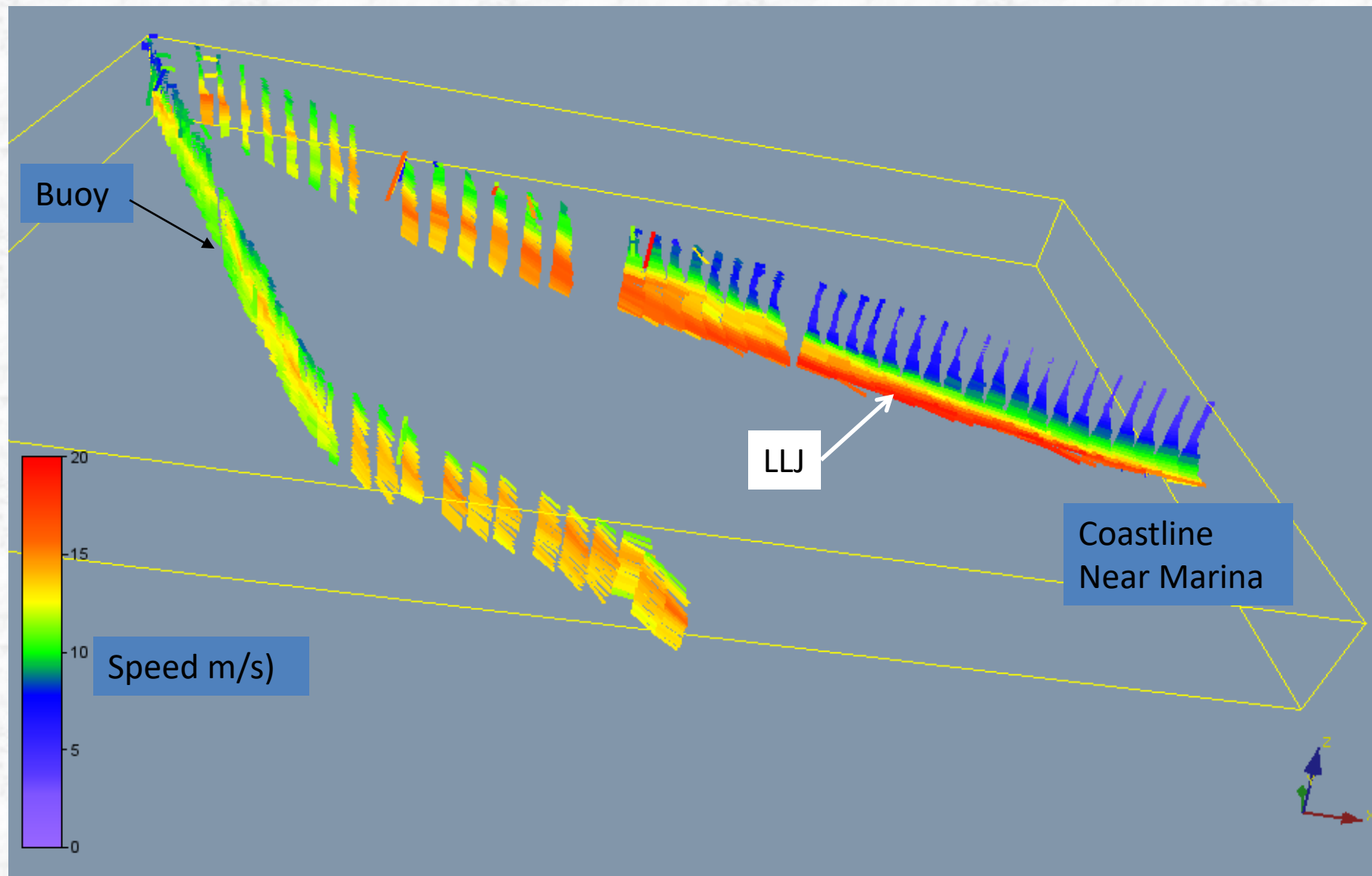


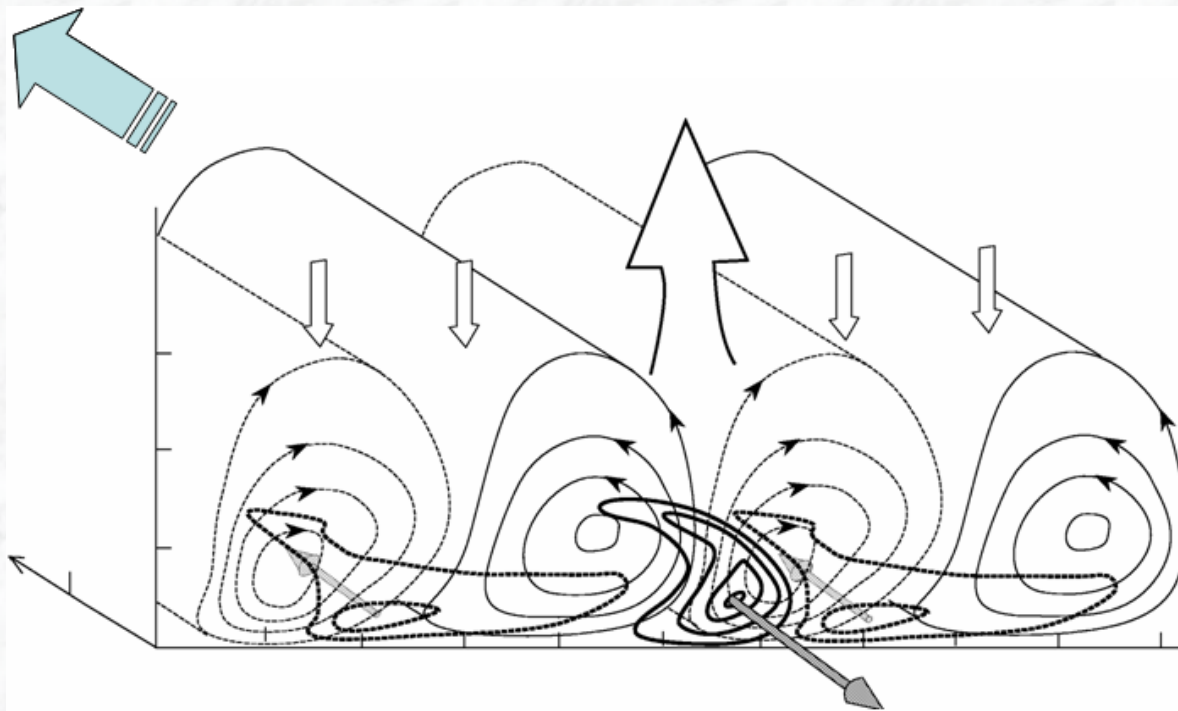
Comparison with 4km MM5



TODWL flight 6:07 pm PST 18 April 2007

Monterey Bay, California





OLEs

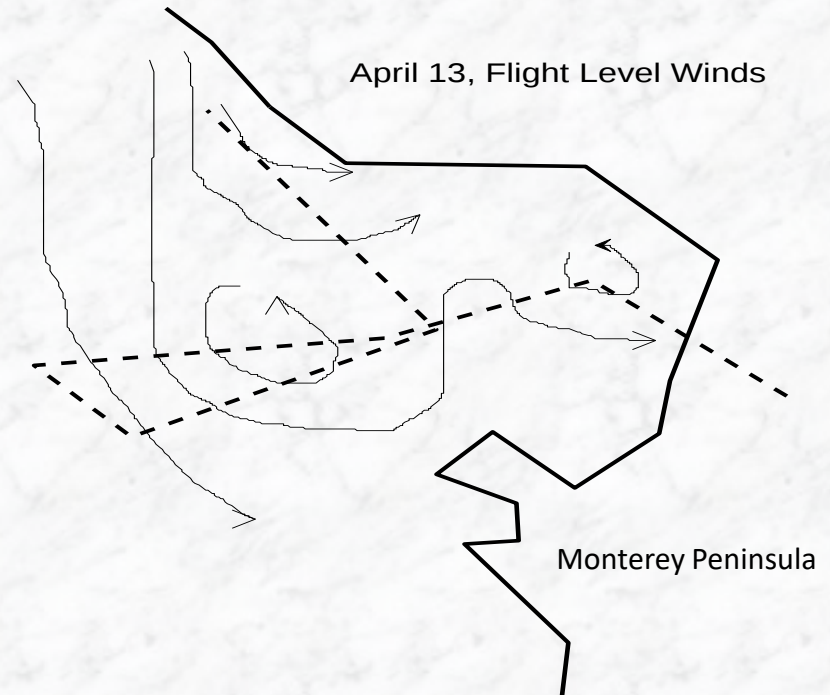
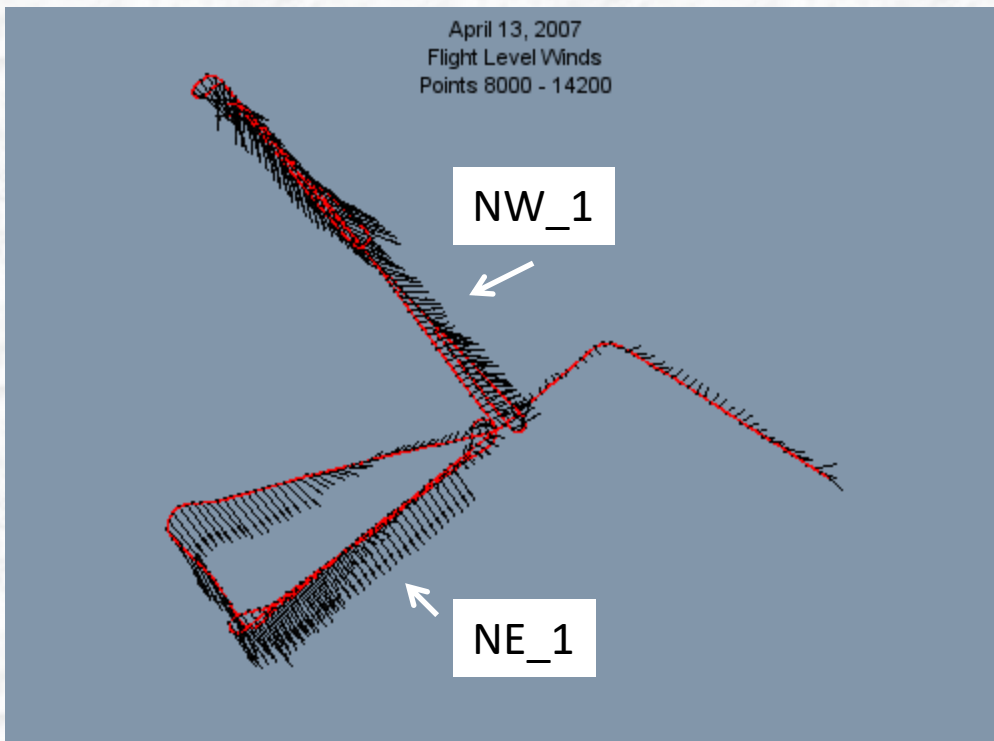
Organized Large Eddies (semi?)
which were targets for many
of the shallow angle
scanning flight segments

Wavelength: Larger-scale structures ~ 700 to 5000 m
Smaller-scale structures ~ 300 to 700 m

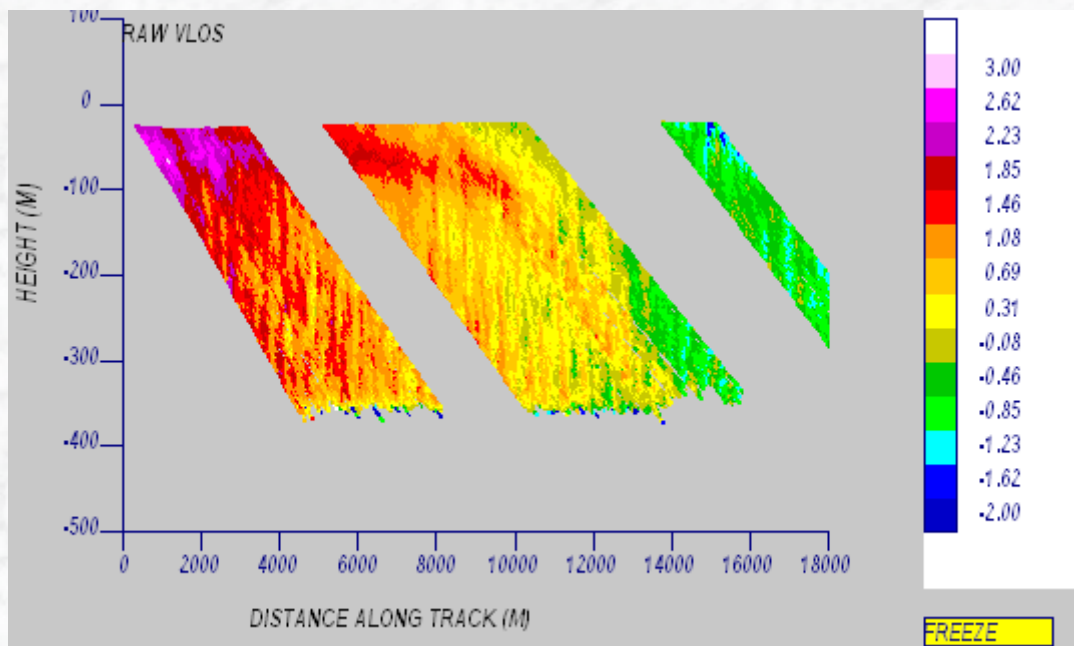
Velocity Perturbations: $\pm 7 \text{ m s}^{-1}$ typical
DOW $\pm$ "10s of" m s^{-1}

Orientation: Typically along-mean TCBL wind, wide variability

Prevalence: Larger-scale structures ~ unknown, (35% to 70%)
Smaller-scale structures: ***Always Present***

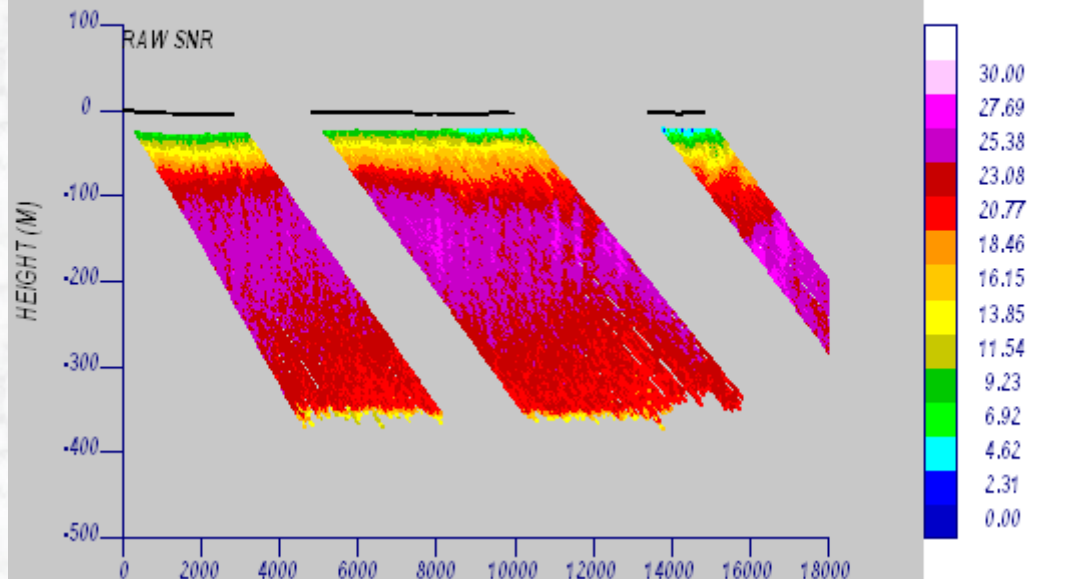


April 13, 2007 flights with CTV

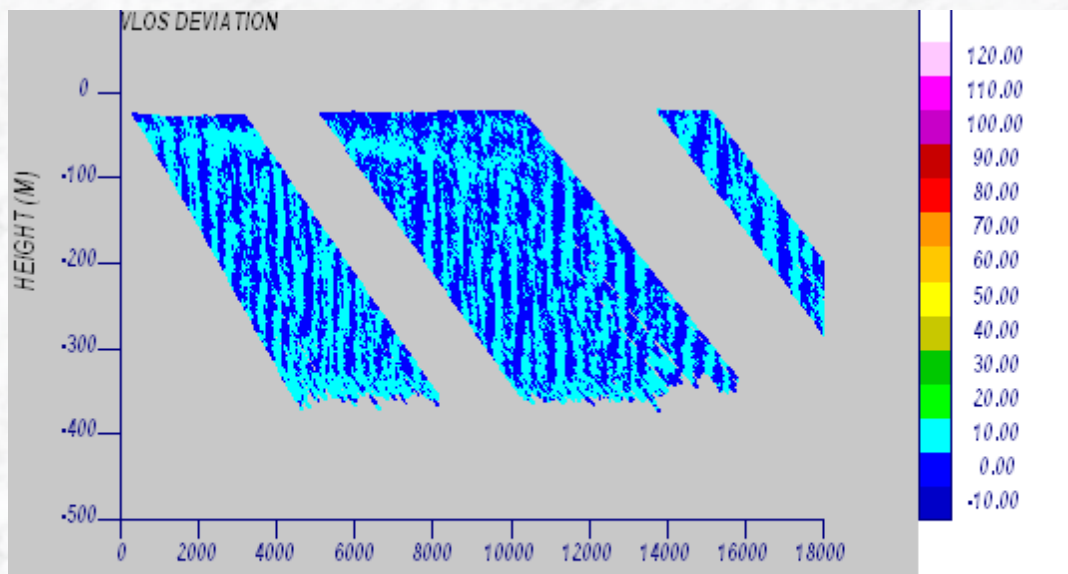


Height is distance
below flight level

NE_1



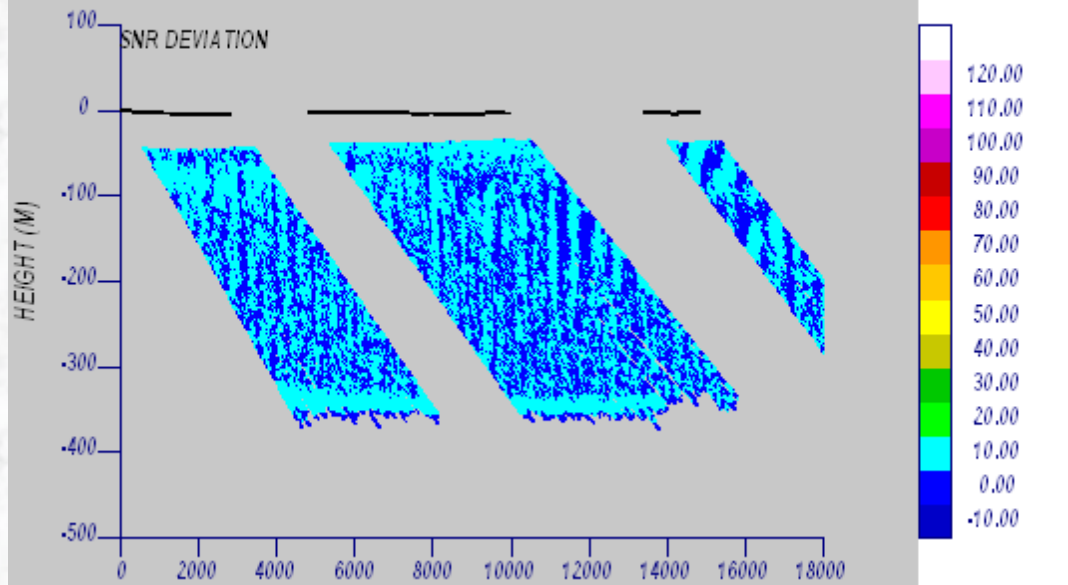
Range corrected
signal intensity



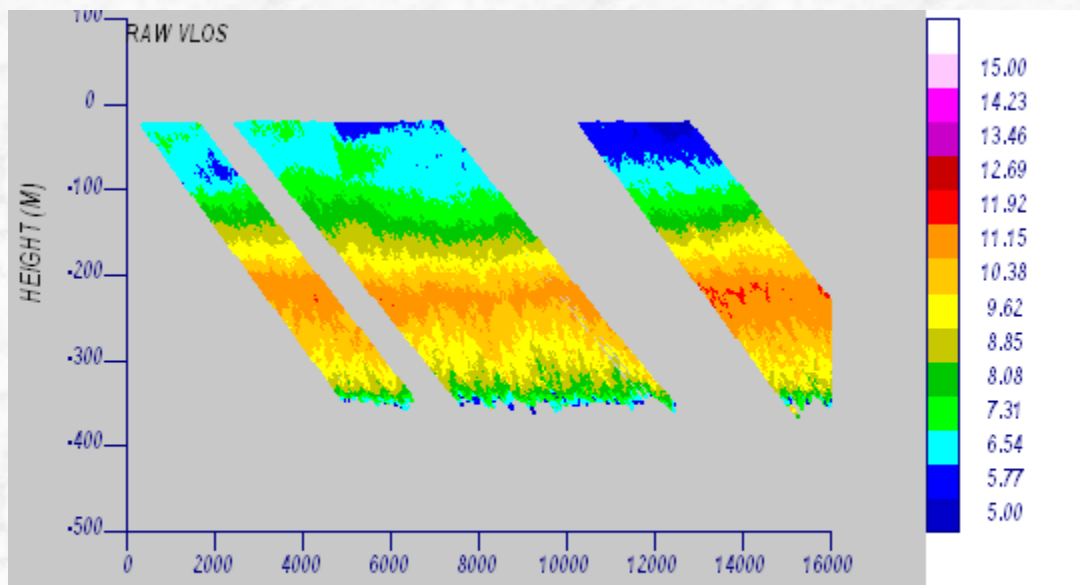
Color scale set to highlight positive and negative LOS velocity deviations from layer average velocity

FREEZE

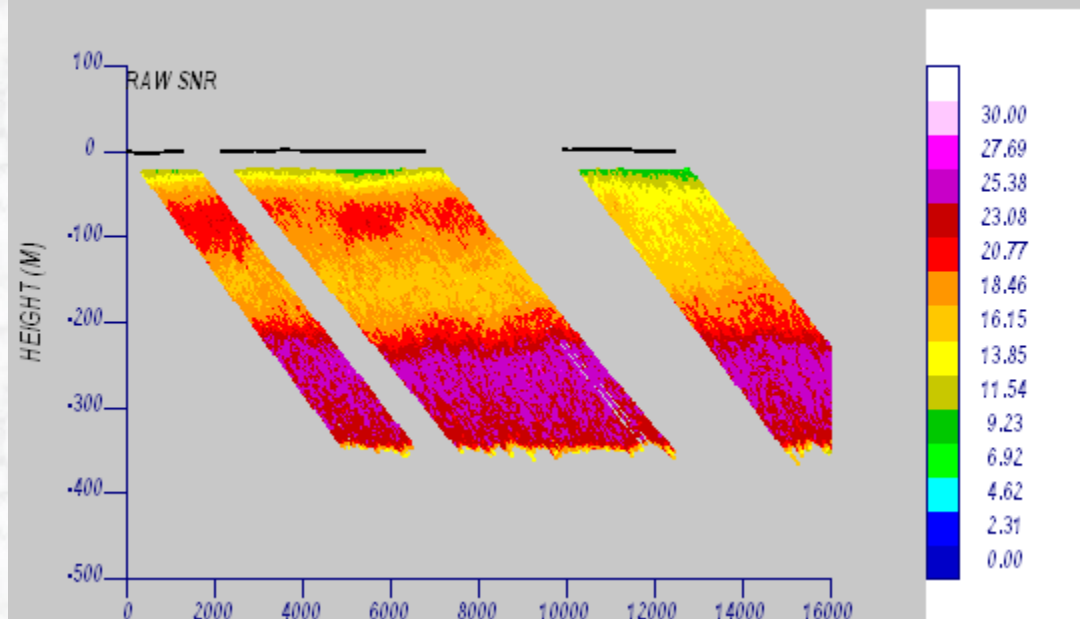
NE_1



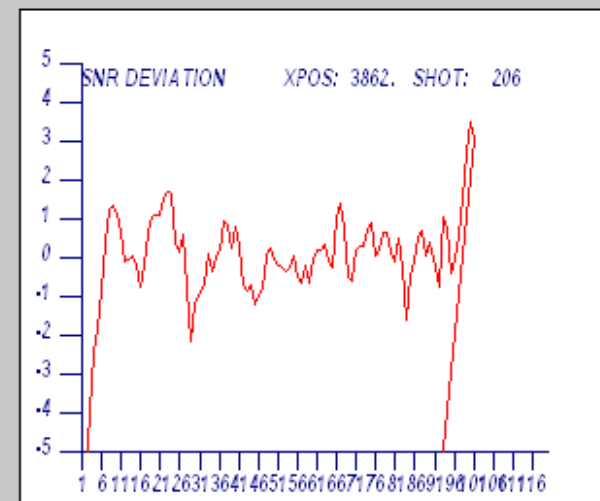
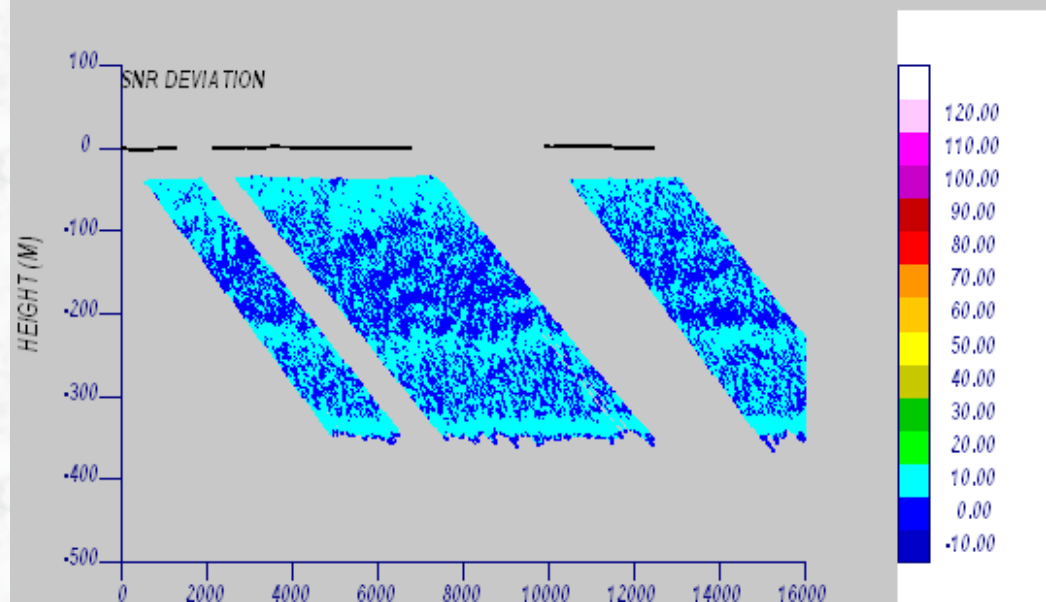
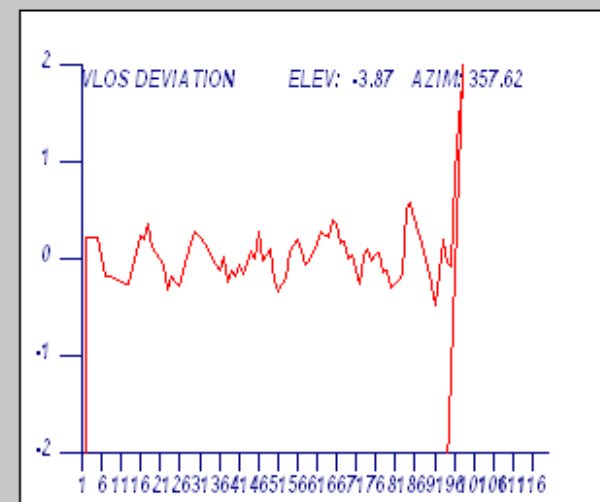
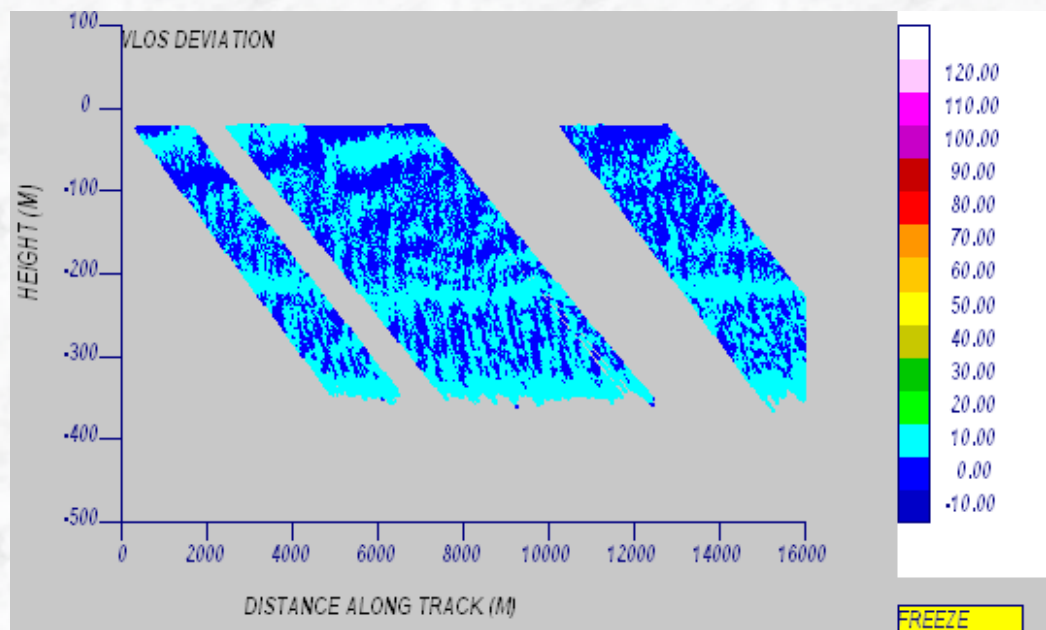
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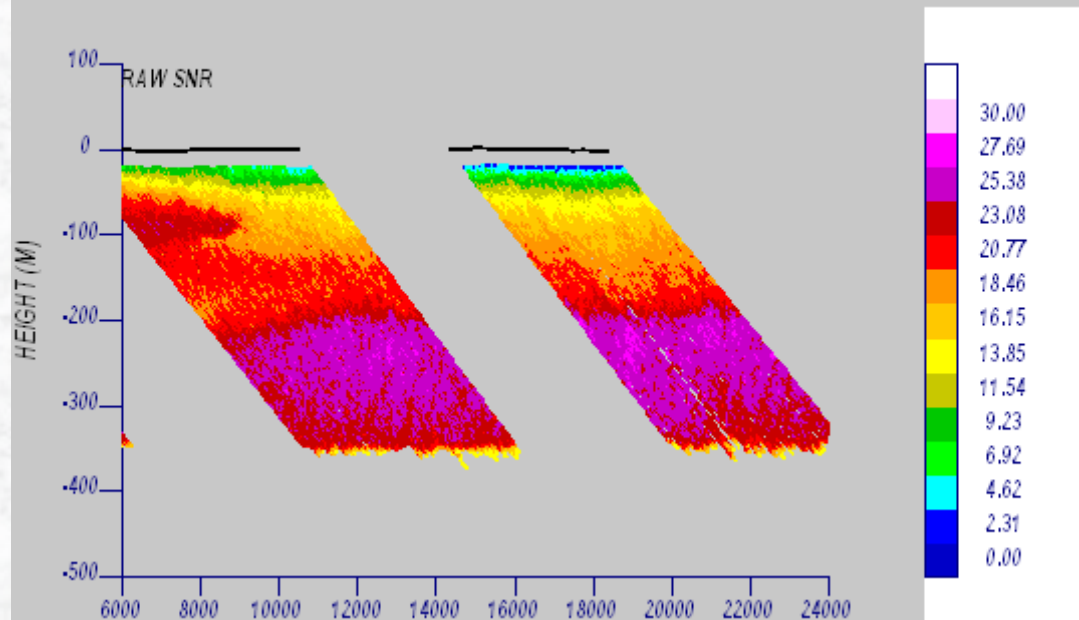
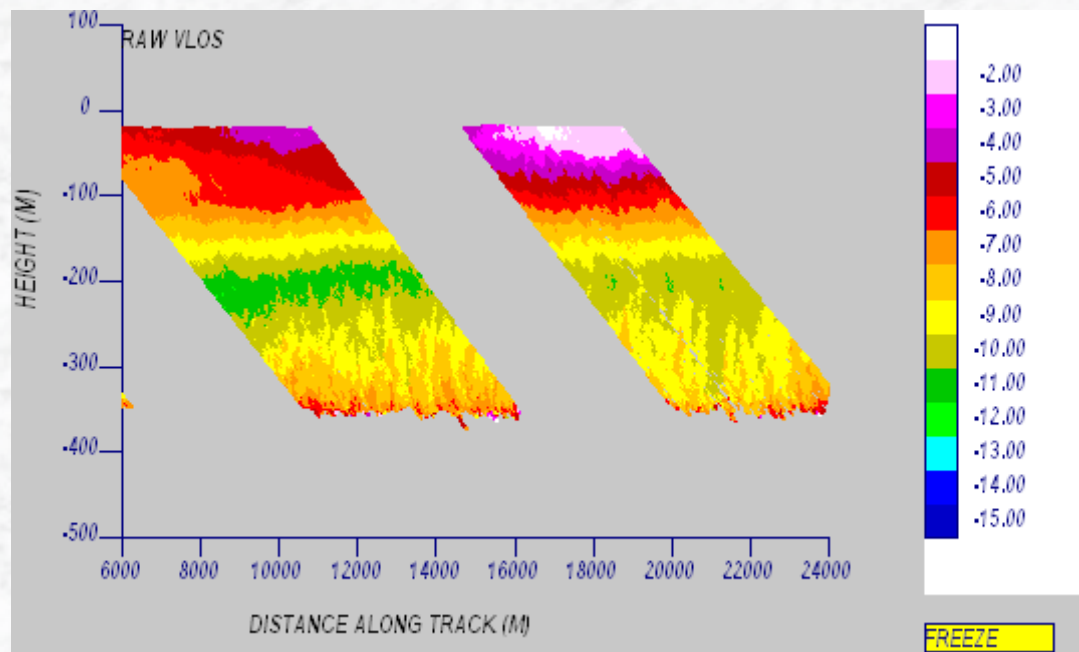


FREEZE

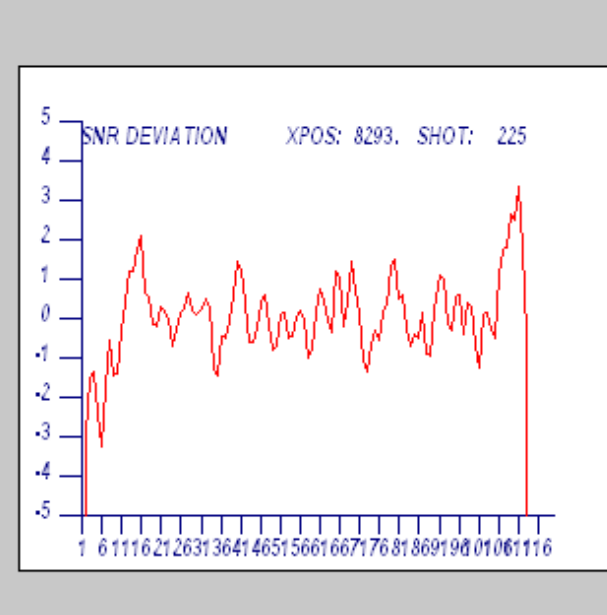
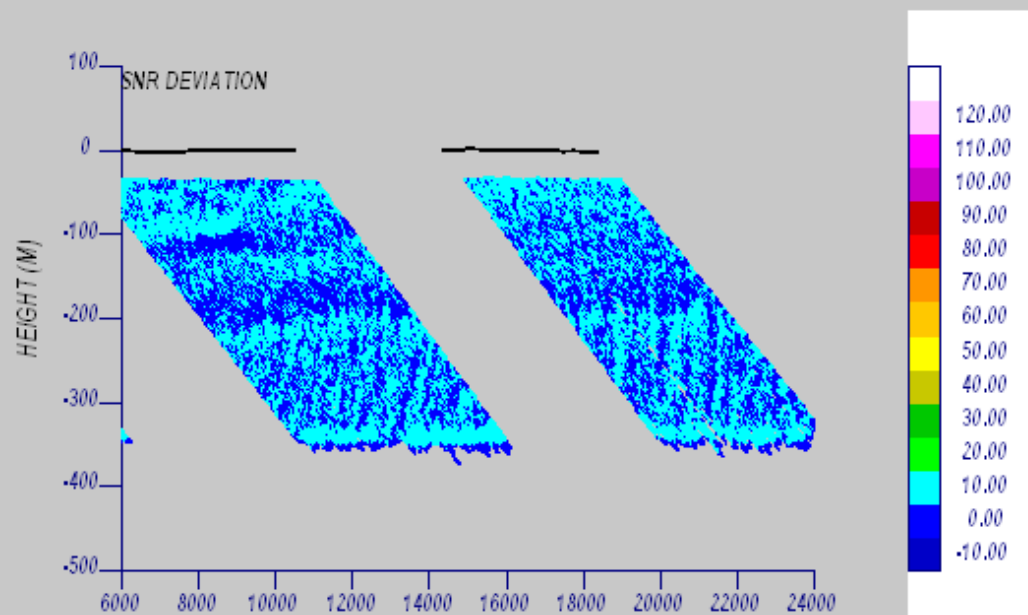
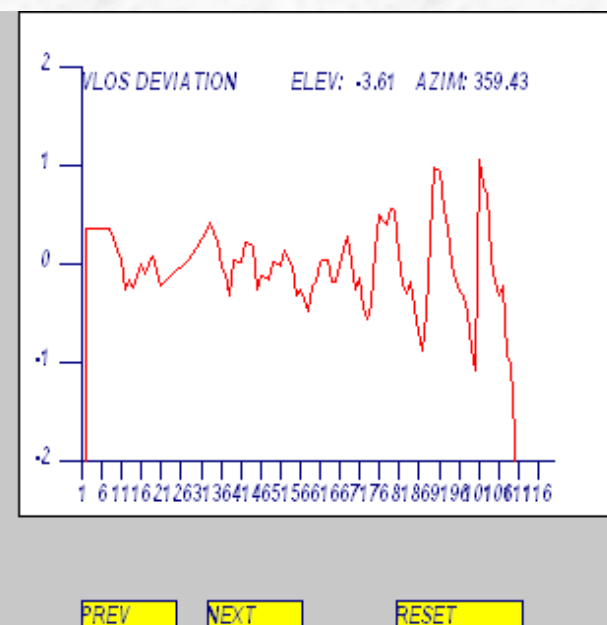
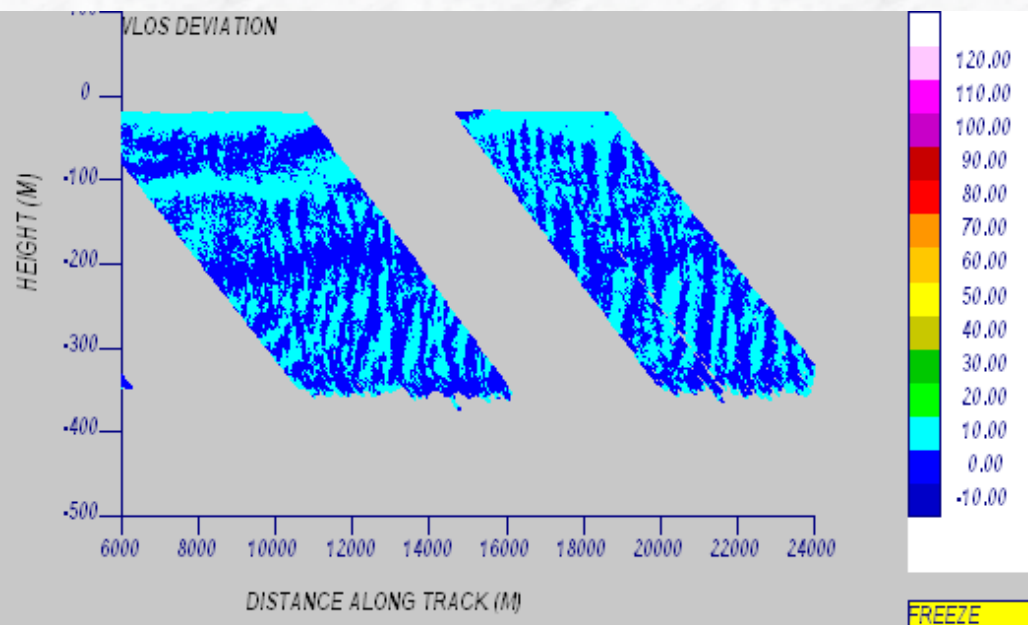


NW_1





SE_1



Summary

- Both the TODWL and P3DWL are providing interesting visualizations and quantifications of MBL aerosol and wind structures that likely have a significant impact on energy exchange and MBL evolution.
- We (Foster and Emmitt) are now funded to use these data along with models to address the challenge of a unified parameterization of energy and mass fluxes in the MBL (EDMF).