

Visualization and Fusion of Model and Airborne DWL Data within Google Earth

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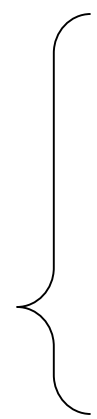
16 June 2009
LWG, Wintergreen, VA

ADLAATS and I-LIMMS SBIRs

- ADLAATS (Airborne Doppler Lidar Analyses and Adaptive Targeting System)
- I-LIMMS (In-flight Lidar Integrated Mission Management System)
- Autonomous on-board observation management and processing of airborne Doppler Wind Lidar data
- **On-board comparisons between DWL observations and model predictions** with rules for switching observation modes; model validation
- **Visualization of data and comparisons in real-time for mission management**

How was Google Earth selected?

- 1) Optimize in-flight data collection & processing
- 2) Real-time 4D analysis/visualization from various perspectives, evaluate COTS:

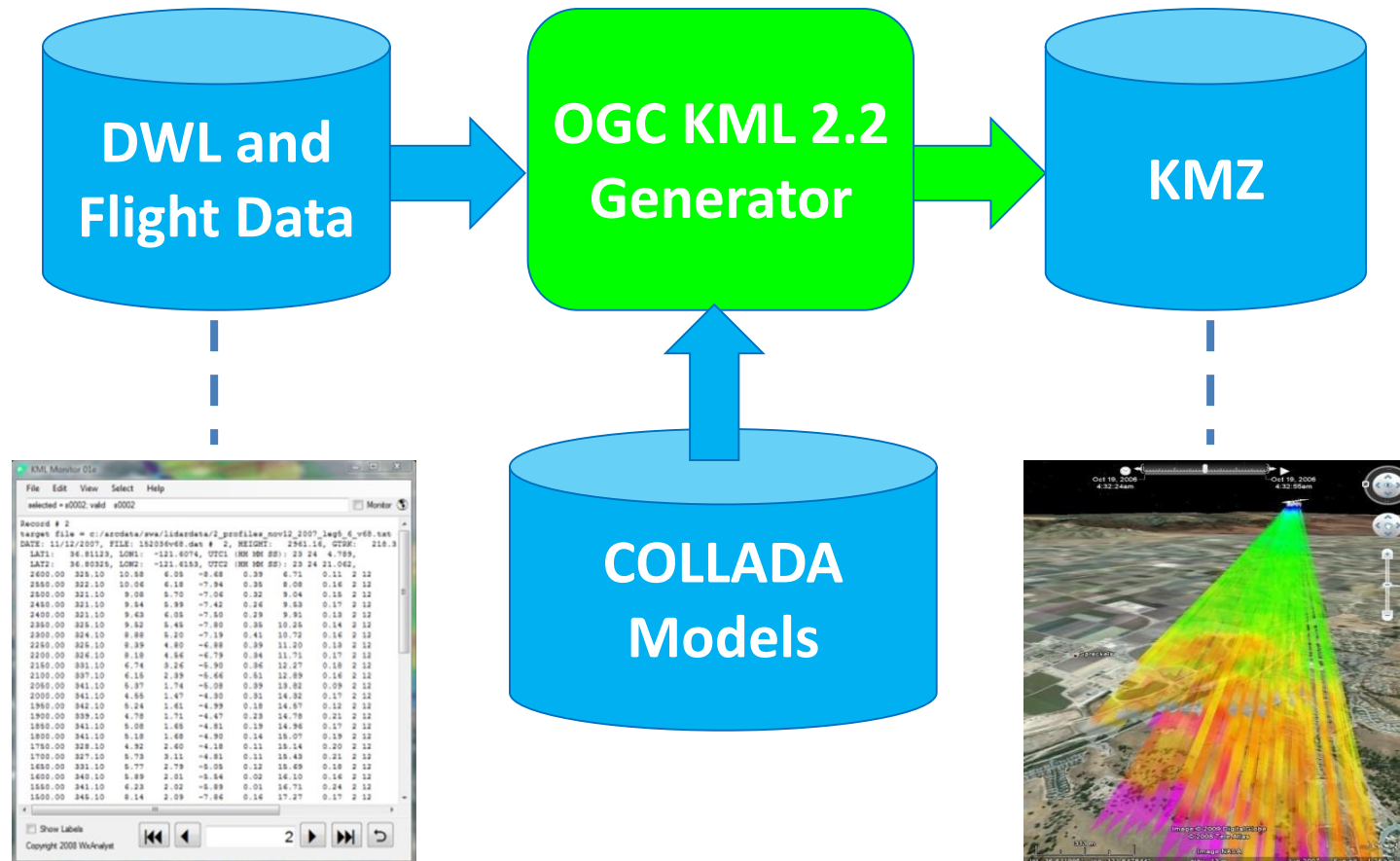
- IDL
 - GIS (ESRI ArcGIS, GeoTools, ...)
 - Voxler (3D)
 - Virtual Globe (Google Earth, ...)
 - ...
- 
- ✓ ease of use
 - ✓ learning curve
 - ✓ user adoption
 - ✓ functionality
 - ✓ licensing & costs

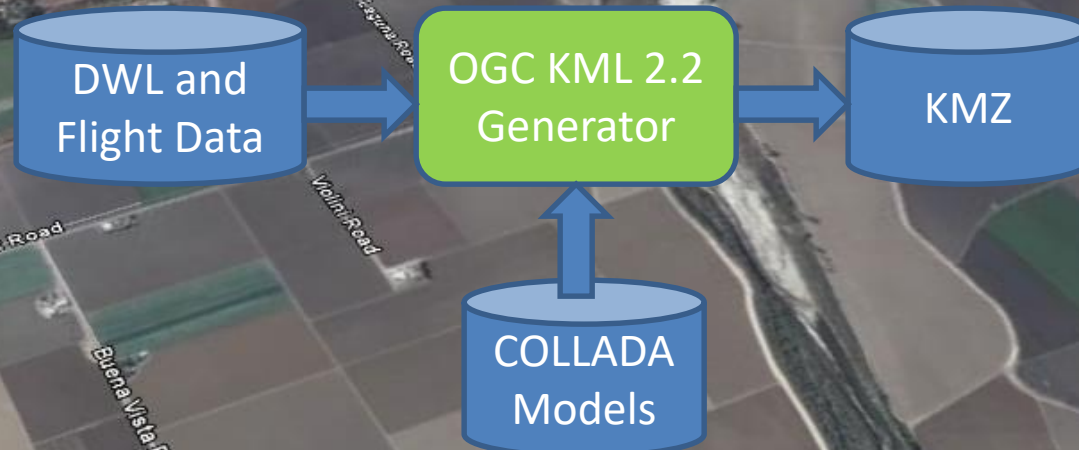
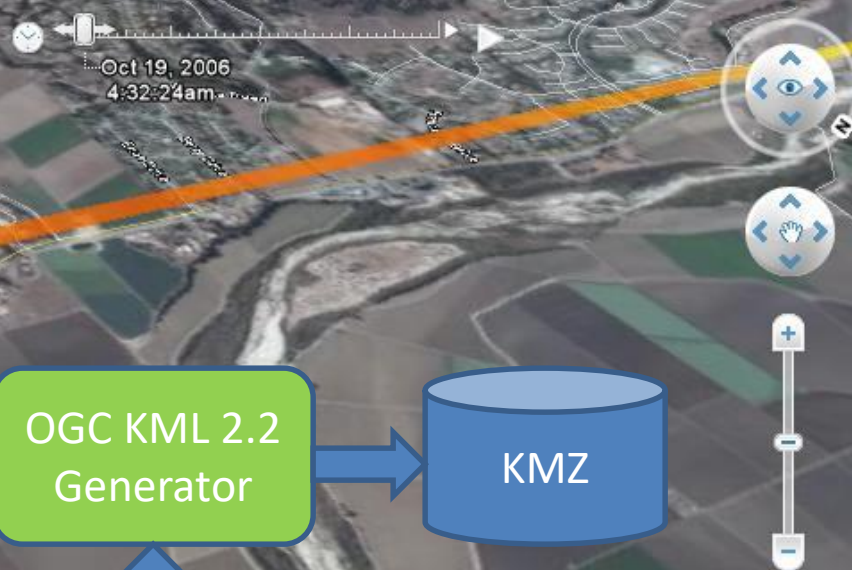
- 3) Enable non-instrument scientists to operate lidar
- 4) Merge into system for aircraft operations

^a In-Flight Lidar Integrated Mission Management System (I-IMMS)

Airborne DWL with Google Earth

How it works





On-board processing delivers GIS/GE products in real time

Eyesafe 2 μ m coherent detection , 1-2 mJ pulse energy (330 nsec pulse) at 500 Hz repetition rate
10 cm bi-axial scanner, side door mounted
Weight: 700 lb Power: 1.5 KW (~7-10% total system efficiency)

Image © 2008 DigitalGlobe

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674 m

elev 18 m

Nov 14, 2005

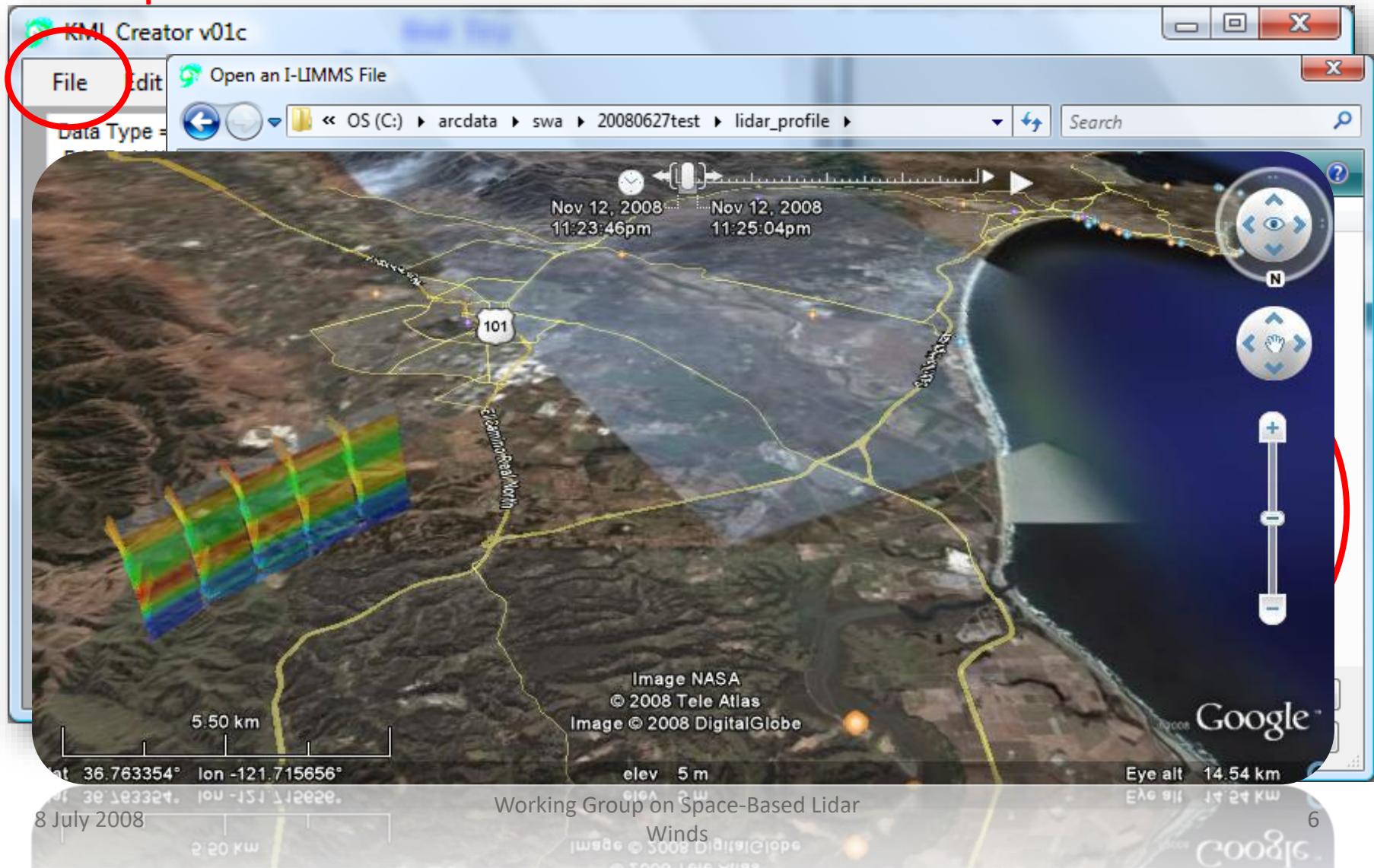
Eye alt 2.36 km

lat 36.603641° lon -121.605941°

KML Creator

generates KMZ “on-the-fly”

1. Open File



Real-time Processing

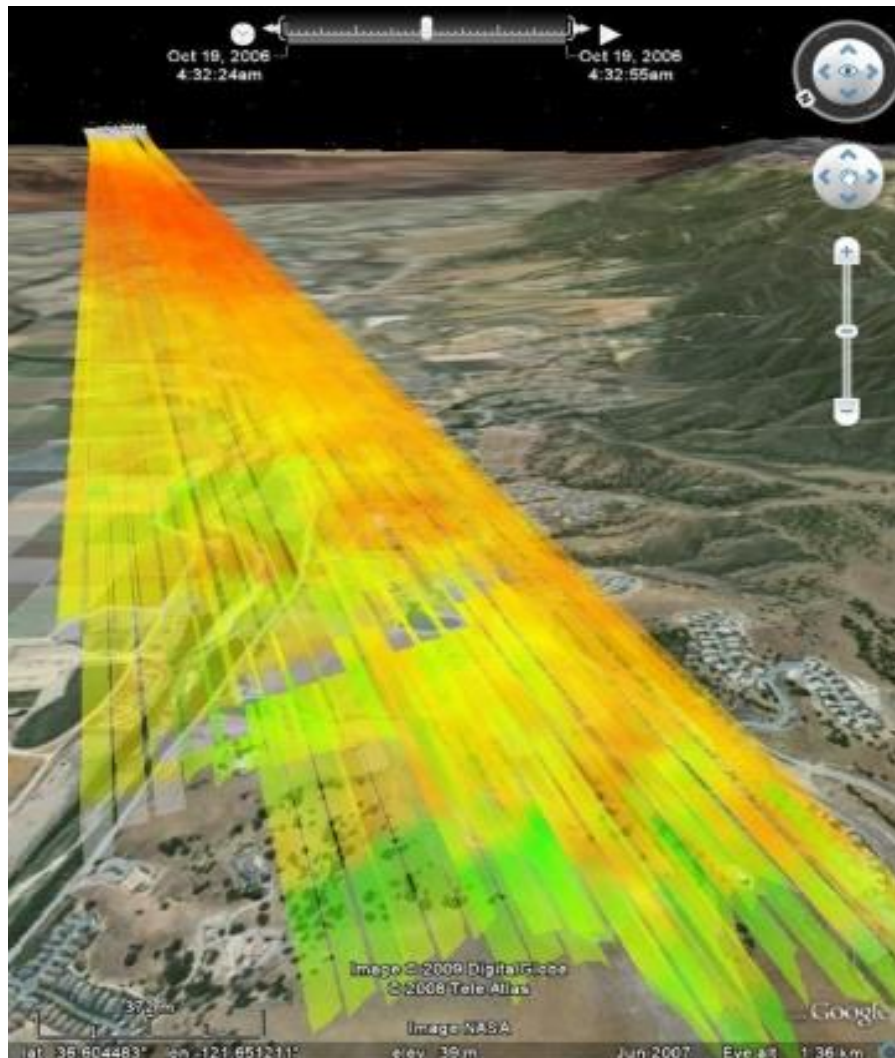
(1) Control of Google Earth API

- Interactive Location, User Queries (GIS functions), Data Loads on-the-fly
- Animation & time controls

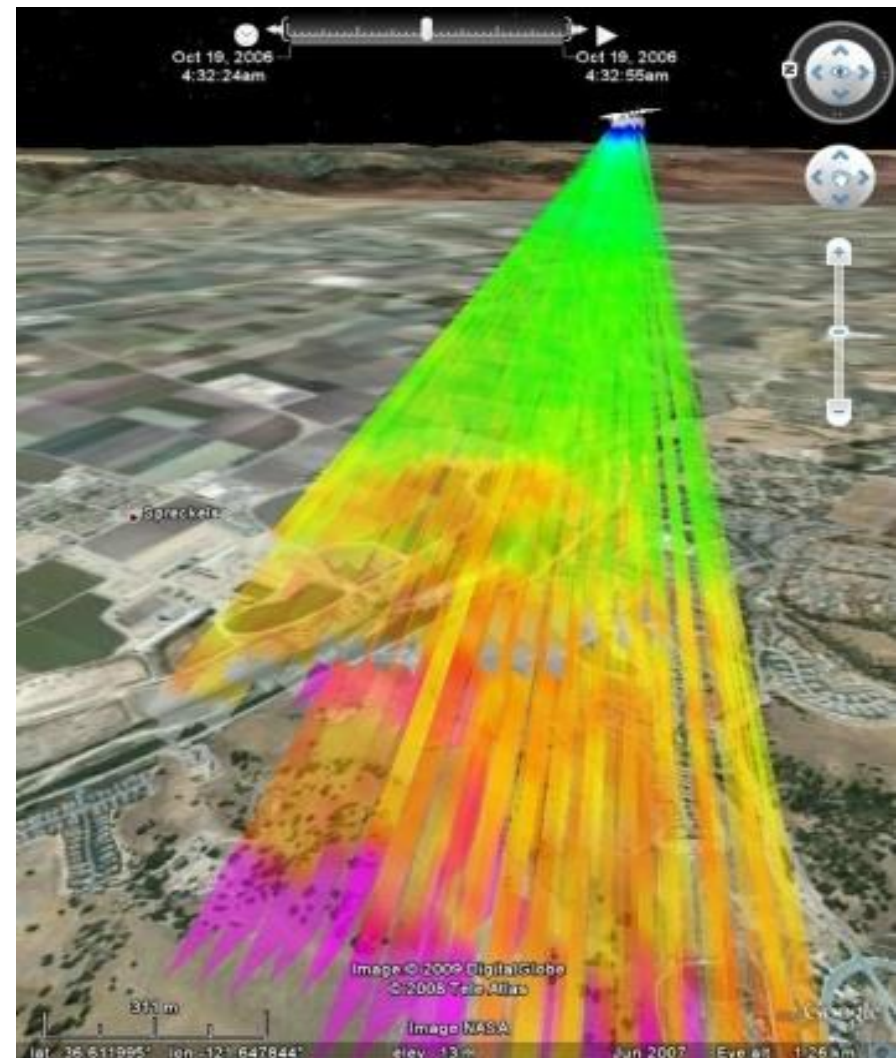


Airborne DWL Sampling Geometry

Raster Scan Patterns



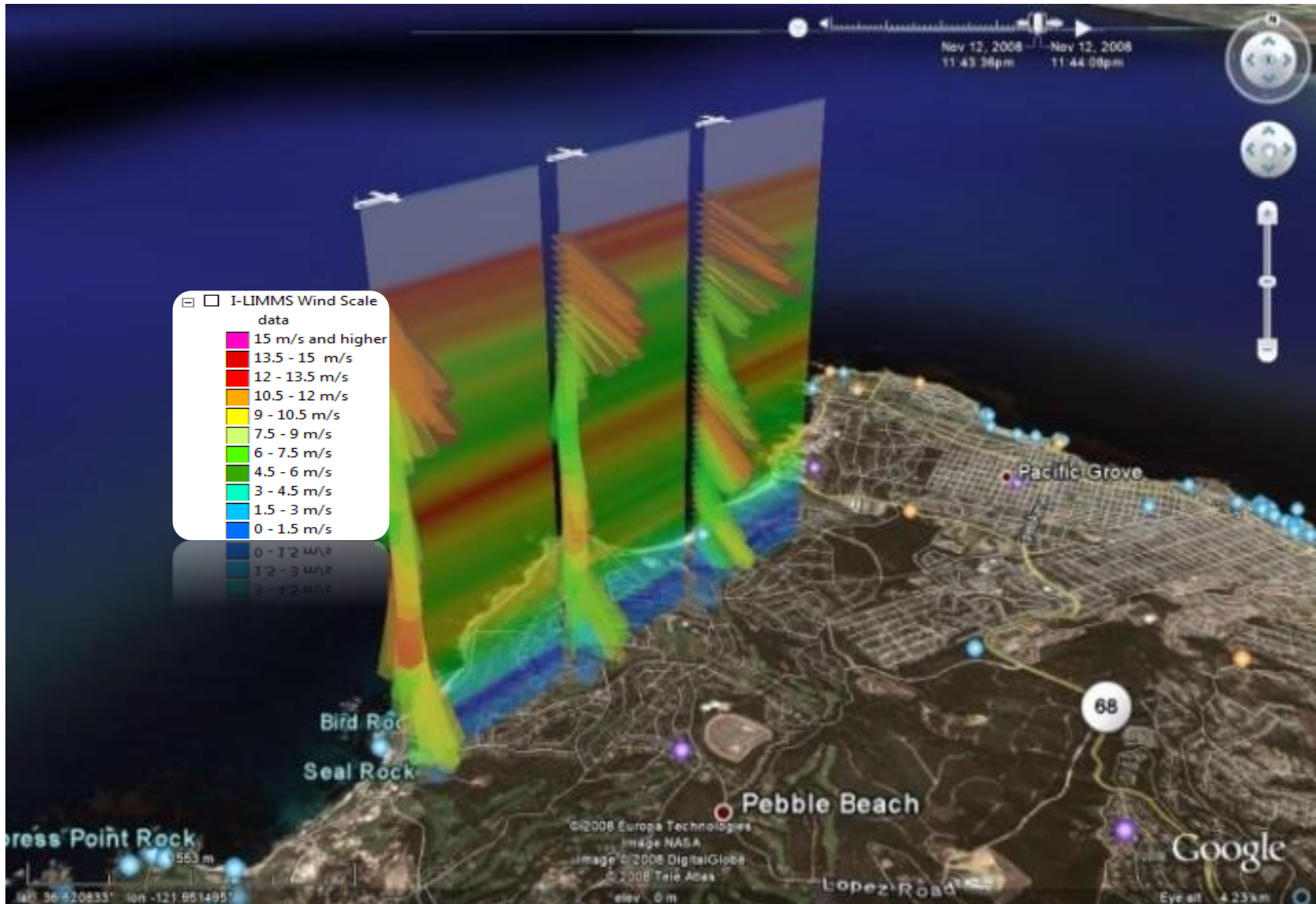
Radial Wind Speed



Backscatter (SNR)

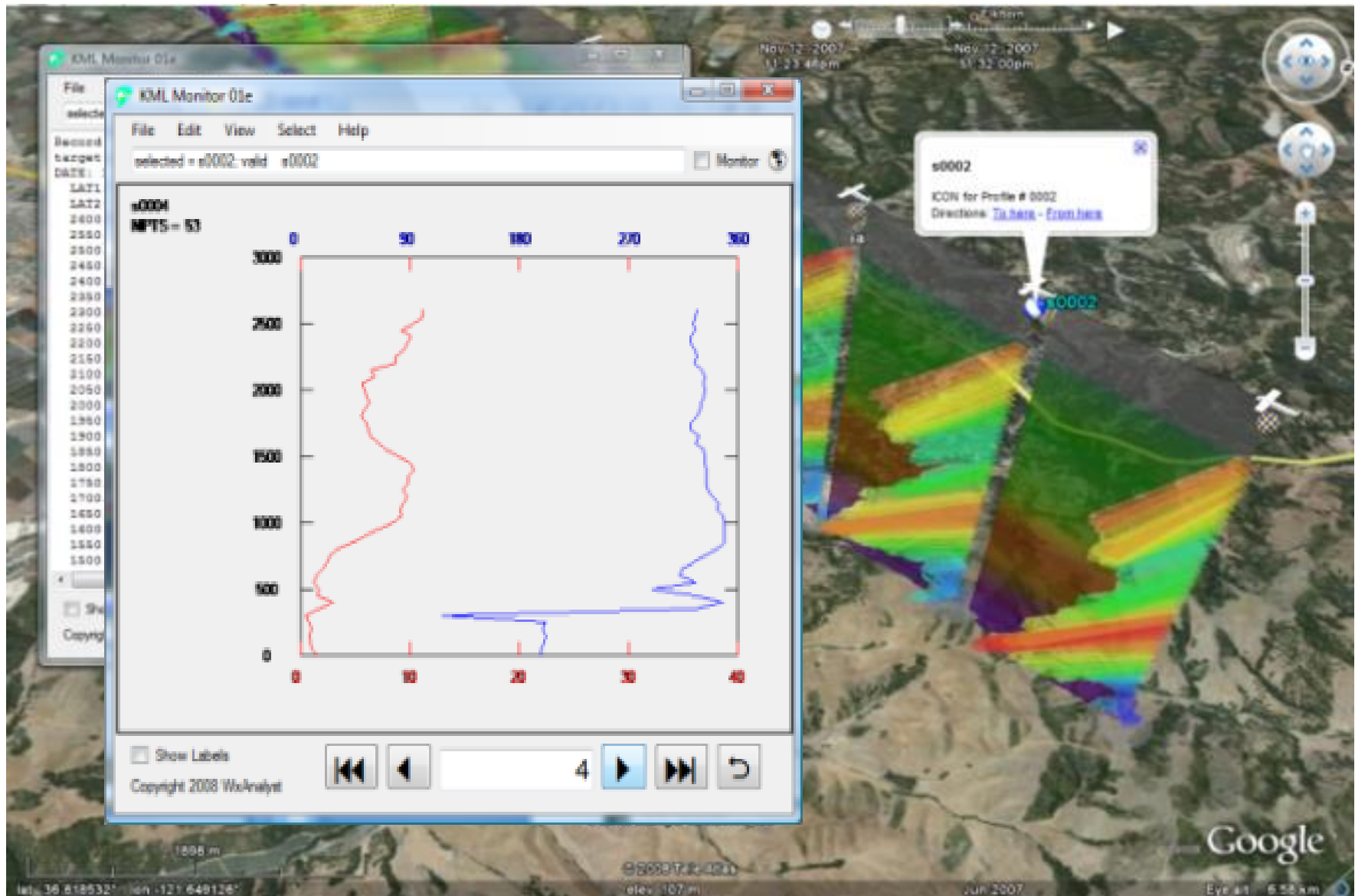
Airborne DWL Visualization

Wind Speed and Direction



Airborne DWL Interaction by ICON

“KML Monitor”

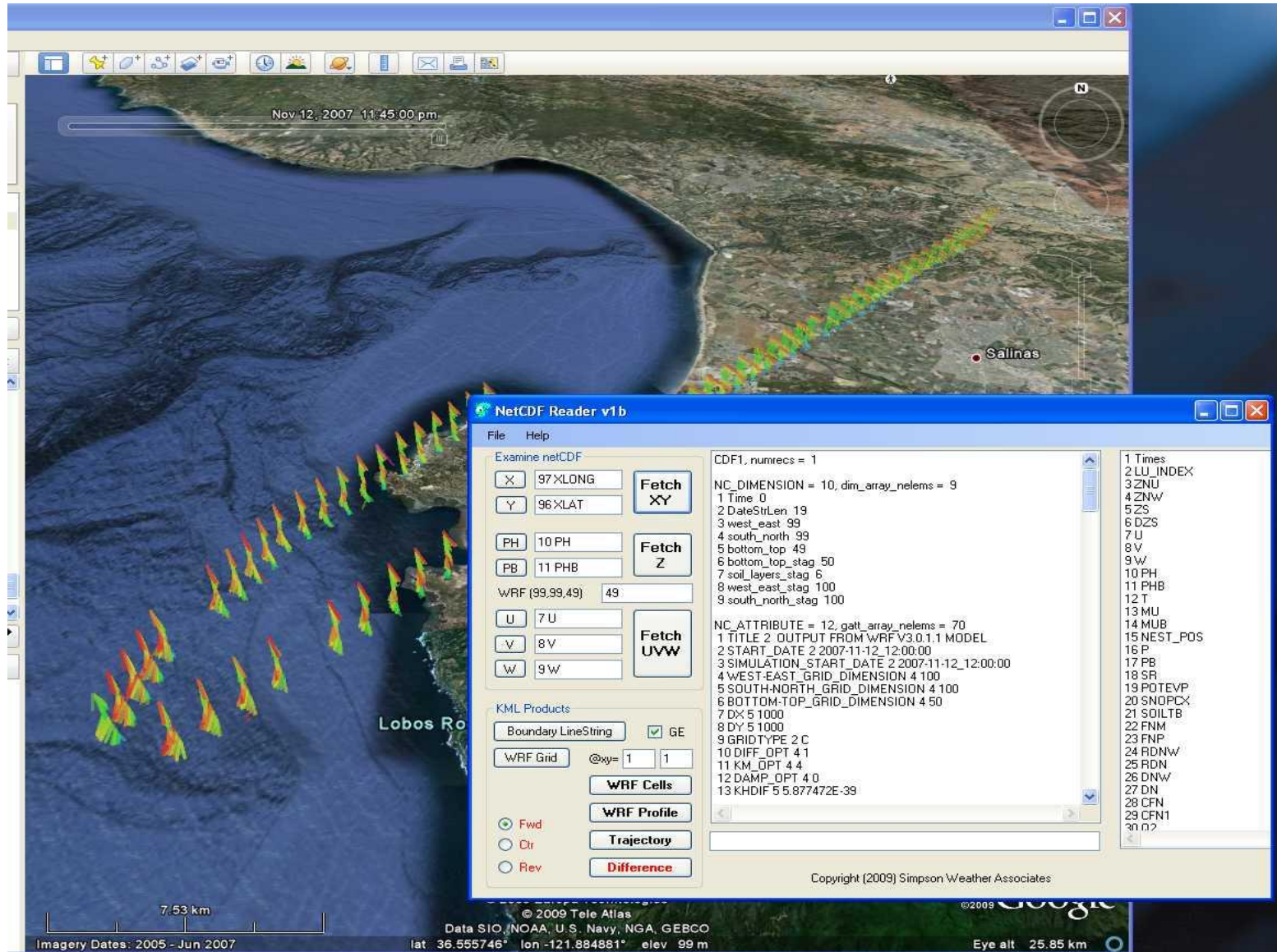


Airborne DWL Analysis

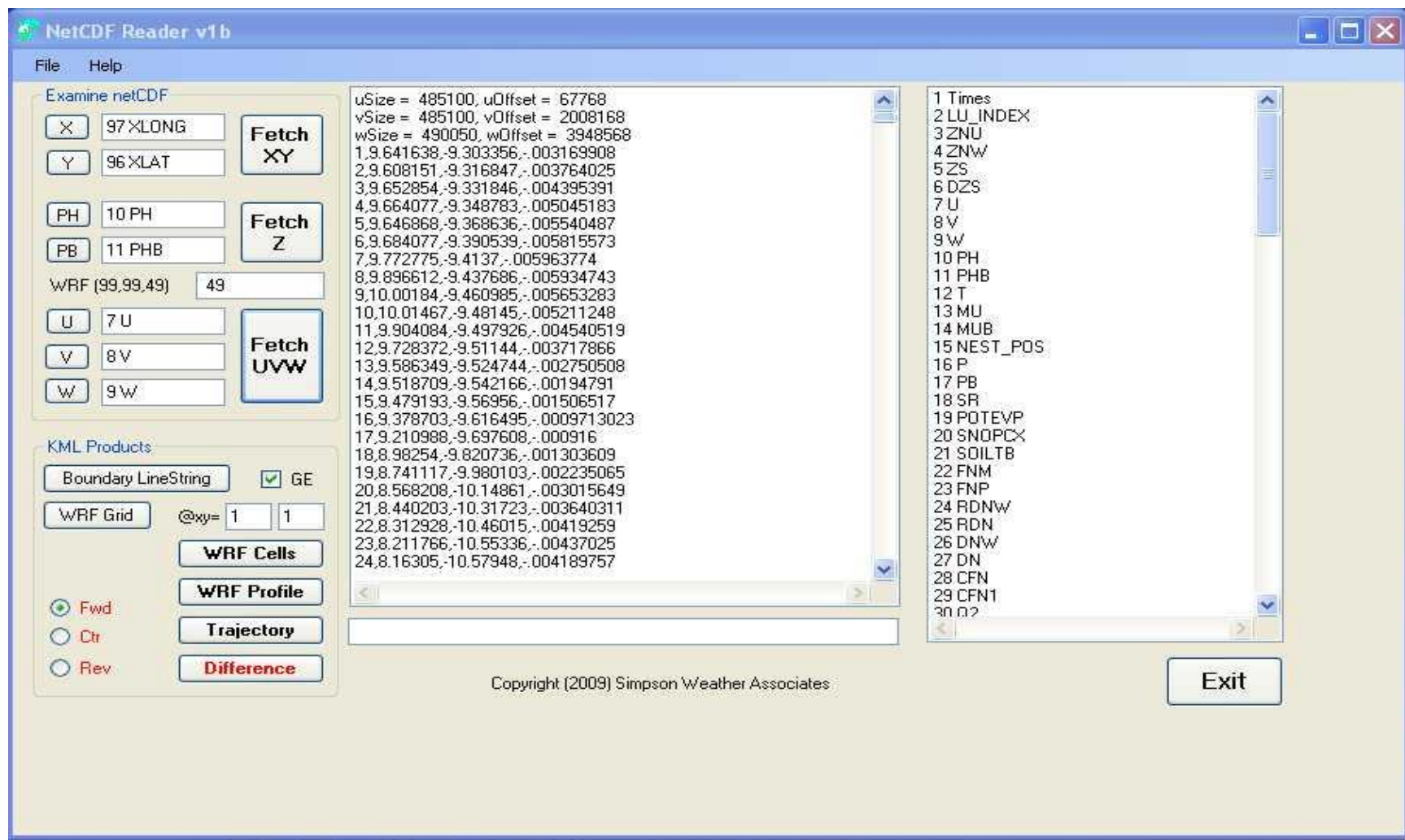
Comparison with 4km MM5 Model Run



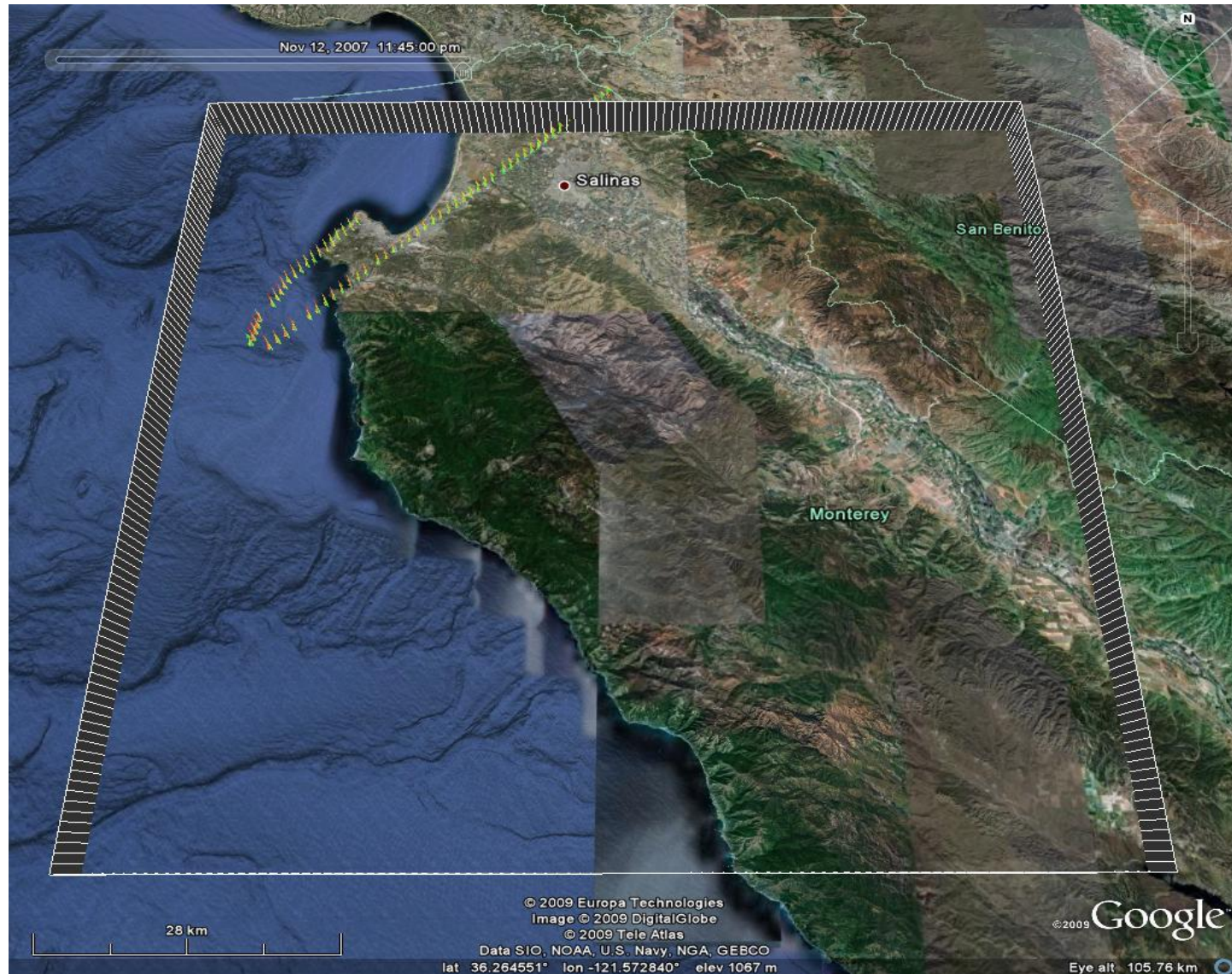
Airborne DWL and WRF Comparisons



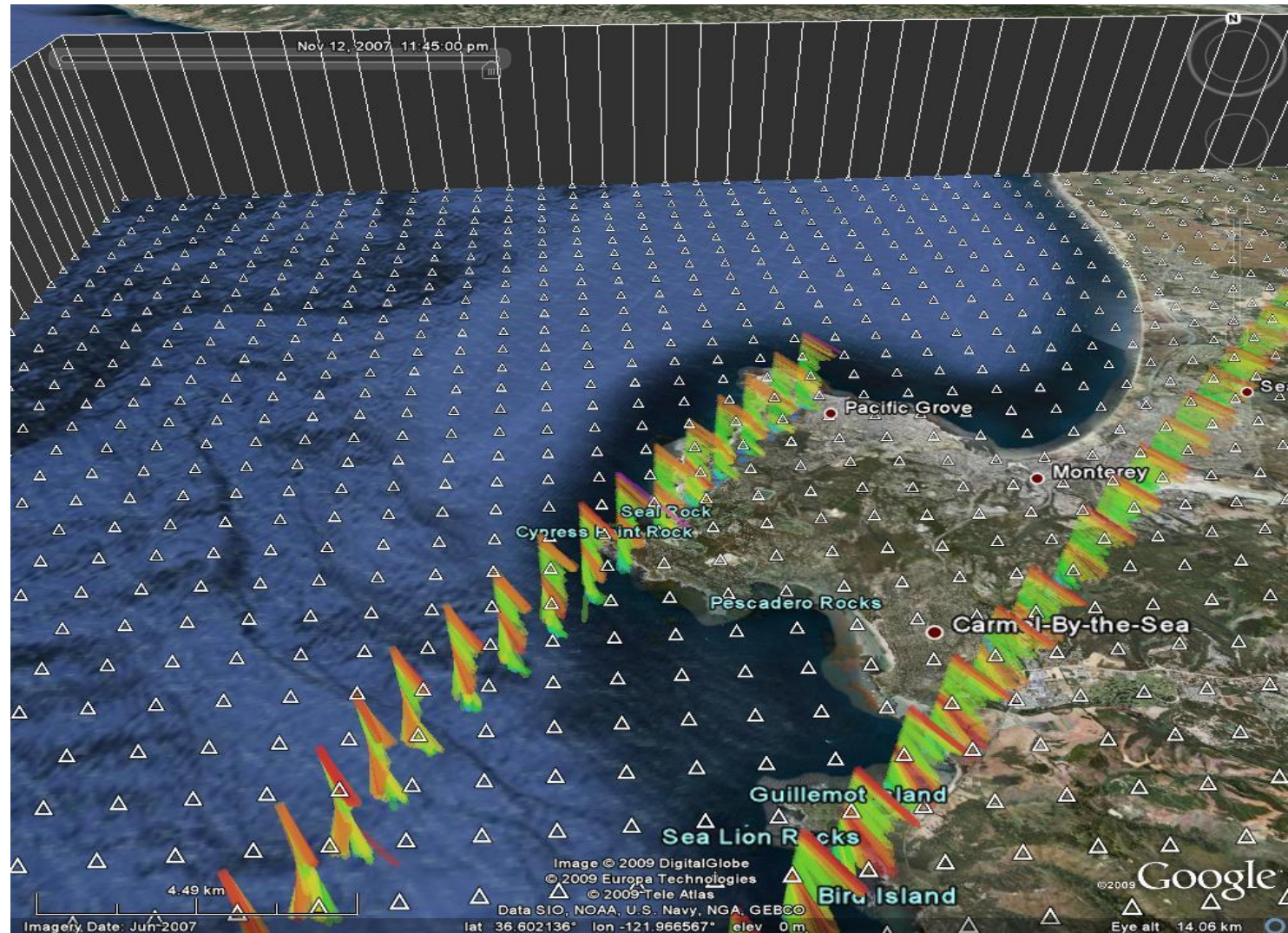
Airborne DWL and WRF Comparisons



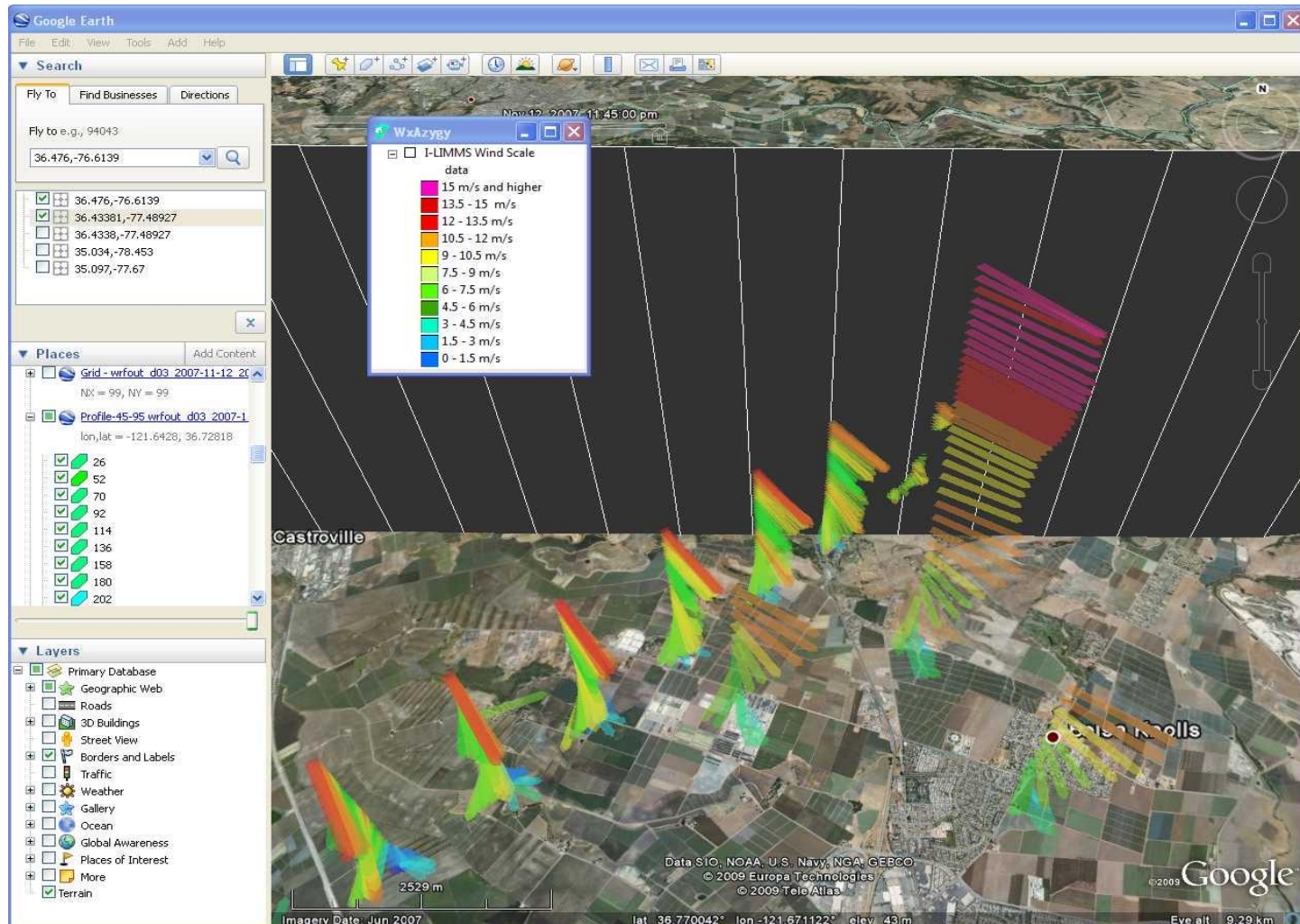
Airborne DWL and WRF Comparisons



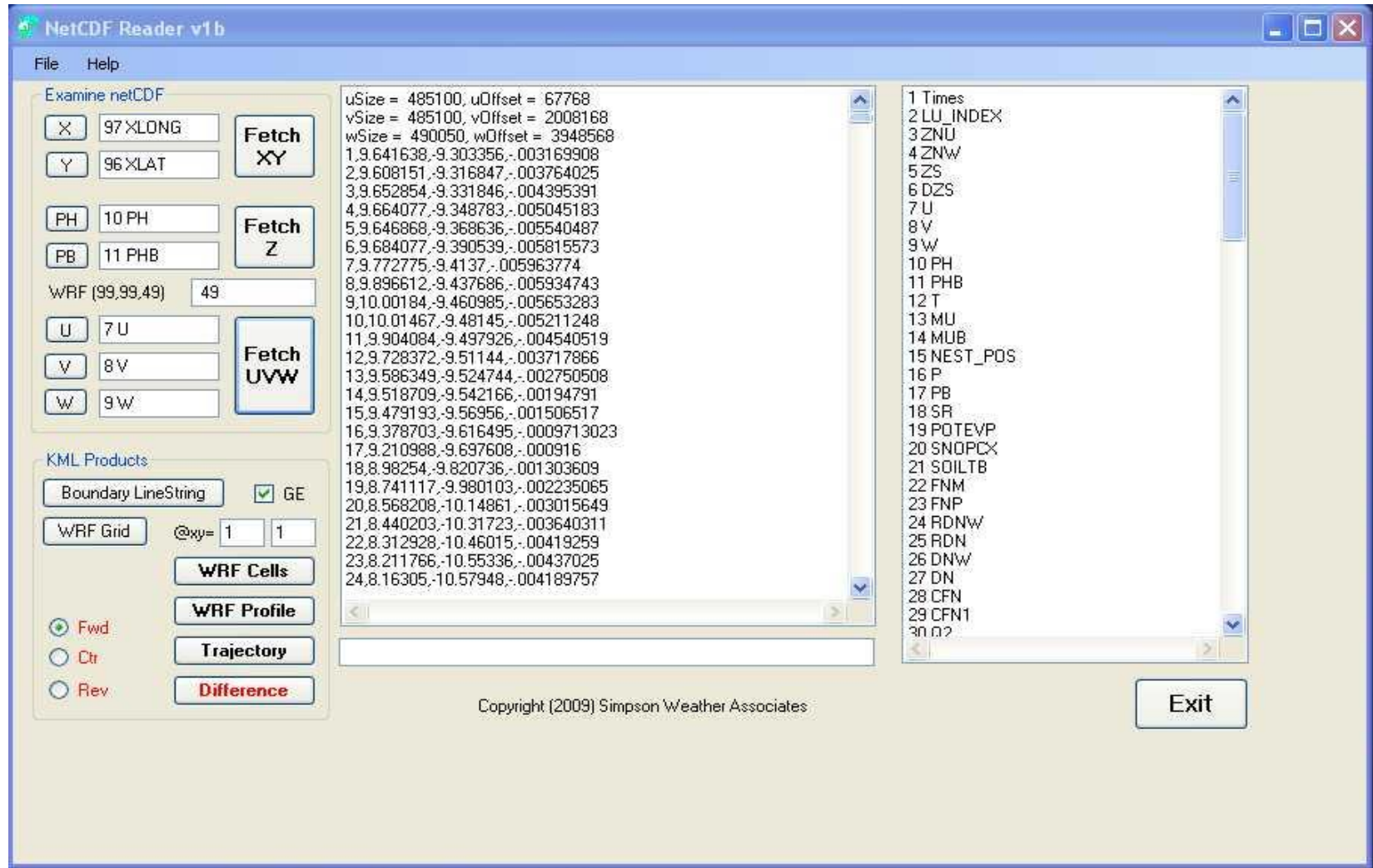
Airborne DWL and WRF Comparisons



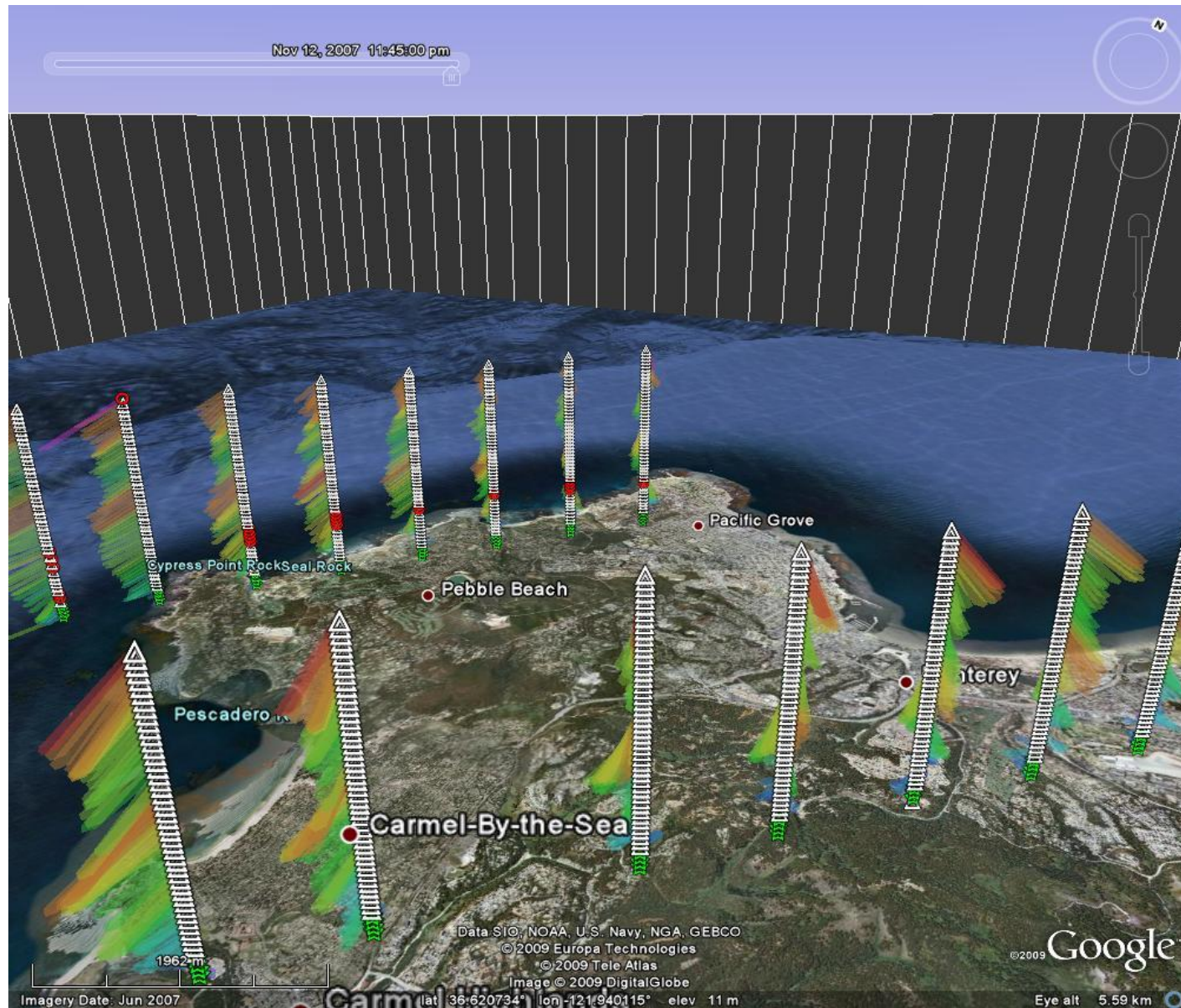
Airborne DWL and WRF Comparisons



Airborne DWL and WRF Comparisons



Airborne DWL and WRF Comparisons



Airborne DWL and WRF Comparisons



Ongoing and Future Work

- Fine tune algorithms for interpolation and comparison
- Provide tabular/quantitative comparison data within GE
- Extend to LOS comparisons
- Generalize software and extend to other numerical models