



STEREO PHOTOGRAMMETRY DURING DEEPWAVE NEW ZEALAND

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DEEPWAVE: Photogrammetry



Previously used in 2006 Terrain-induced Rotor Experiment (T-REX), Owens Valley

OBJECTIVES

- 1. Study the effects of moisture on initial wave generation and propagation**
 - need spatial distribution of cloud/clear boundary (heights of bases and tops, distances from mtns, etc.)
- 2. Bonuses: leeside waves and winds, fog evolution, barrier jets and marine boundary layers**

June 7



June 11



June 13



June 20



How It's Done

Location (wave events):

- Clear view of cloud base and tops
- Facing Hokitika Base
 - to compare with vertical profiles
- Strong cross-mountain winds
- end shooting within 3 hours of takeoff



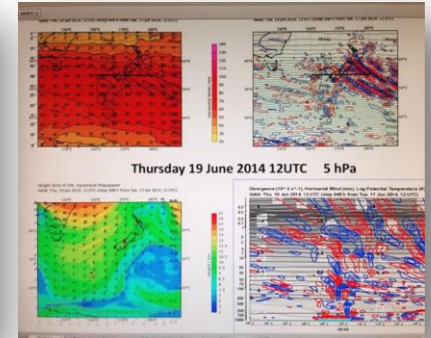
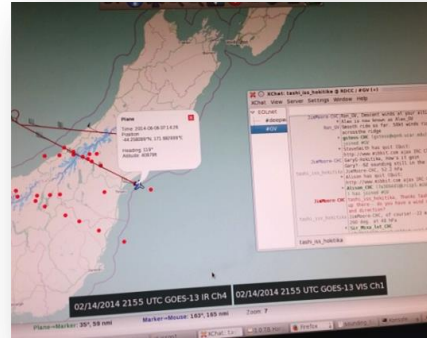
1. 2 cameras: baseline 200-600 m
2. Parallel views by centering each camera in other view & turning
3. Tilt for view of most clouds
4. Capture parallel images on synchronized 5-10 s intervals

(Grubišić and Grubišić 2007)

Hokitika Aero Club

Other benefits of location:

- ✓ Assisting with radiosonde launches
- ✓ Access to x-chat/flight info
- ✓ More scenic/fun

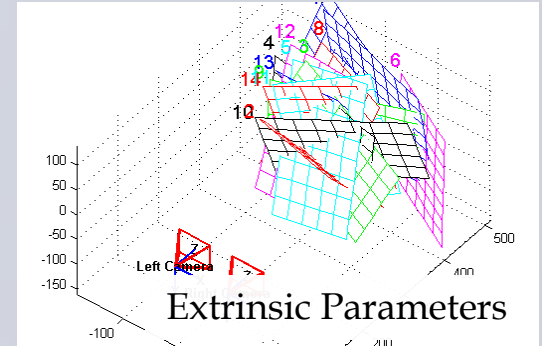
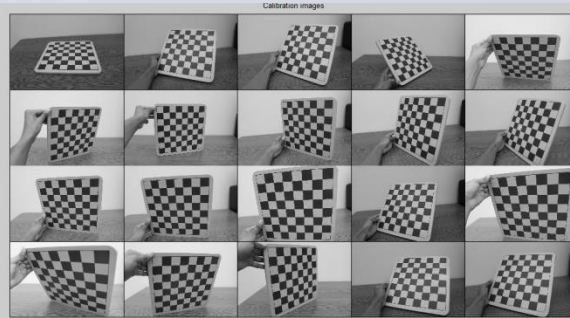


Challenges

- Cows
- Wind
- Mud
- Finding long enough baseline
- Birds, telephone poles, obstructions
- Even elevation
- Leaving



Correcting Lens Distortion



MATLAB Camera Calibration Toolbox,



Left: "Cumulus"

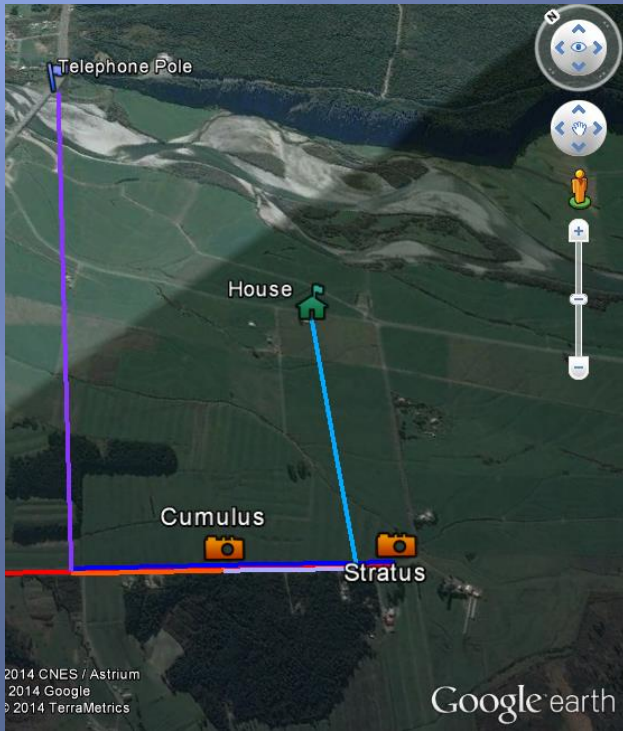
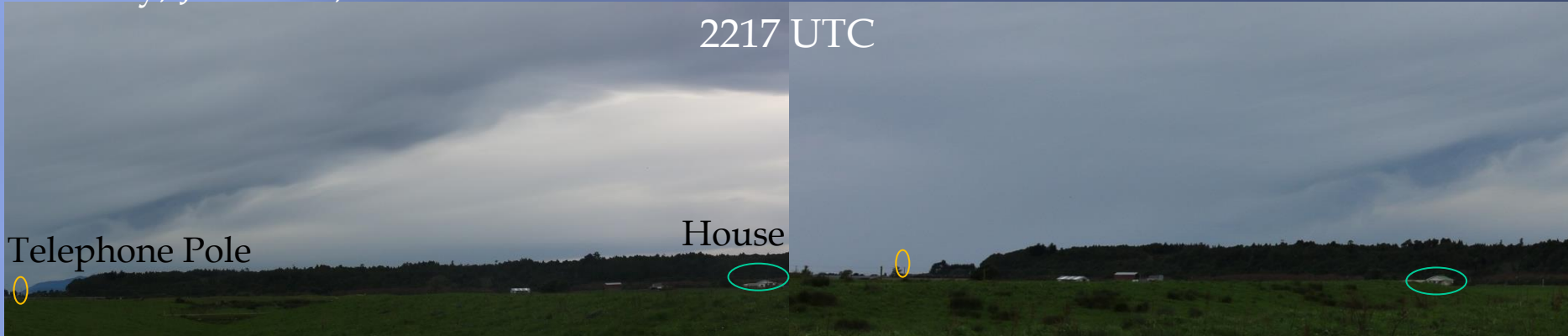


Right: "Stratus"

Triangulation Tests

Tuesday, June 10th, 2014

2217 UTC

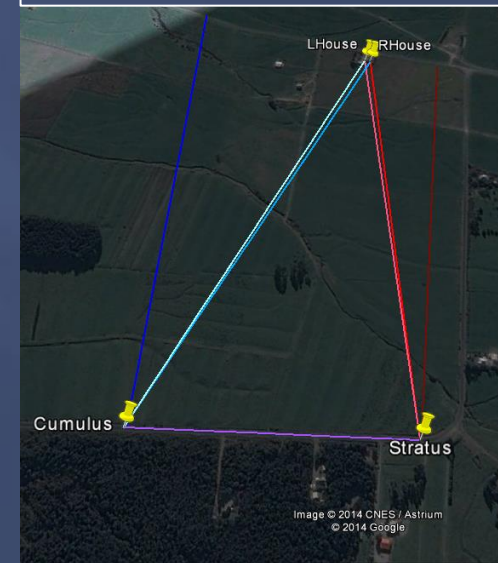


**X-Displacement Values
(Camera coordinates):**
Stratus to House
Cumulus to TelePole

	House	TelePole
Initial	91.73 m	332.3 m
Adjusted	98.85 m	393.5 m
Measured	101 m	392 m

(Rasmussen et. al 2003)

Adjustment for Rotation
Axis (not exactly parallel)
to calculate new camera
headings



IOP 3

- ▣ Images taken from 0023-0329 UTC
- ▣ Passing boundary brings new cloud structure:
 - altocumulus layer with undulatus at the front edge
 - roll clouds and other isolated cumulus underneath
- ▣ Visual observations confirm same structure throughout the night

0220 UTC

0232 UTC



Future Work

- More photo analysis of various days and events
- Using cloud measurements for validation of real-data and initialization of idealized COAMPS simulation
- Creating stereo videos

- Future Dissemination
 - Senior Research Project
 - AGU
 - * Investigating Terrain Effects on Nearshore Cloud Evolution in DEEPWAVE through Time-Lapse Photogrammetry
 - * Limitless in a Field of Endless Discovery
 - AMS
 - * Coastal Time-lapse Stereo Photogrammetry during DEEPWAVE New Zealand



Questions?

