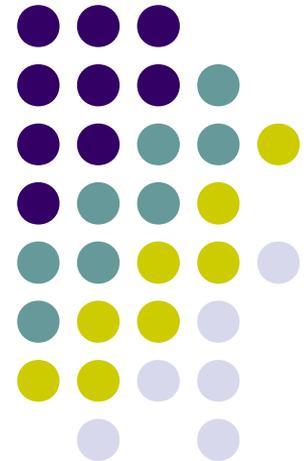
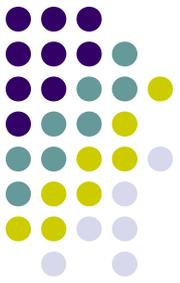


LAAP it up: platforms and processing

Mike Smith
Kingston University



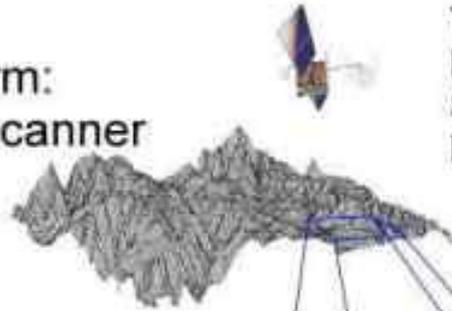
Scales



- Broadly identify three scales:
 - **Micro:** features such as striae, chatter marks etc (~1cm - 10m)
 - **Meso:** features such as sichelwannen, p-forms, roche moutonnees, drumlins (~1m - 50m)
 - **Macro:** drumlins/lineaments (~300m - 80km!)

Satellite Platform:
Multi-spectral scanner

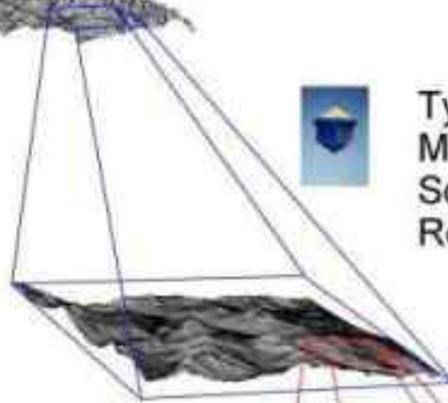
Type: Regional (macro)
Method: Satellite
Scale: ~100 km
Resolution: ~30 m



Kite Platform:
Digital Camera



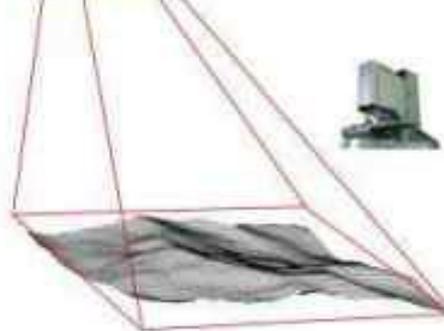
Type: Meso
Method: Kite
Scale: ~1 km
Resolution: ~ 1 cm



Microscope Platform:
Confocal Laser



Type: Micro
Method: Confocal Scanning
Laser Microscope
Scale: ~ 1 m
Resolution: ~ 1 micron



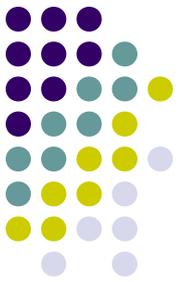
The missing re(s/v)olution . . .



- **Micro:** fieldwork
- **Macro:** satellite
- **Meso:** “missing scale”



Platforms



Why is it missing?

- This can currently be provided:
 - heliborne
 - low-level airborne
 - commercial satellite
- So... other options?









The X100

revolutionary mapping.



All equipment is easily carried to a suitable takeoff location



A small laptop is used in the field for flight planning and monitoring



a gentle toss sends SmartOne on its way

openrelief





↑
Helikites

↓
Skycell



↓
Elevated Platforms



↓
Pigeoncam!

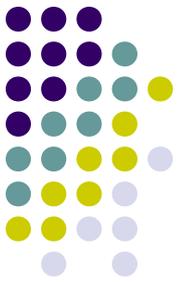


Meso-scale remote sensing



- variety of novel methods
- **not** a new problem
- **KEY:** simple, fast and cheap !!

Pros and Cons

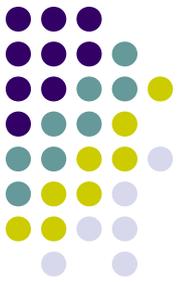


- **Model aircraft:**
 - acquiring coverage of area of interest
 - lifting capacity
 - Stability
 - regulation
- **Balloon**
 - excellent stability
 - expensive transportation/refill (£200)
 - poor in moderate/high wind
- **Telescopic Mast**
 - limited height

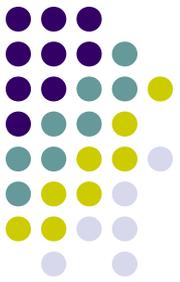


Kites

Kites



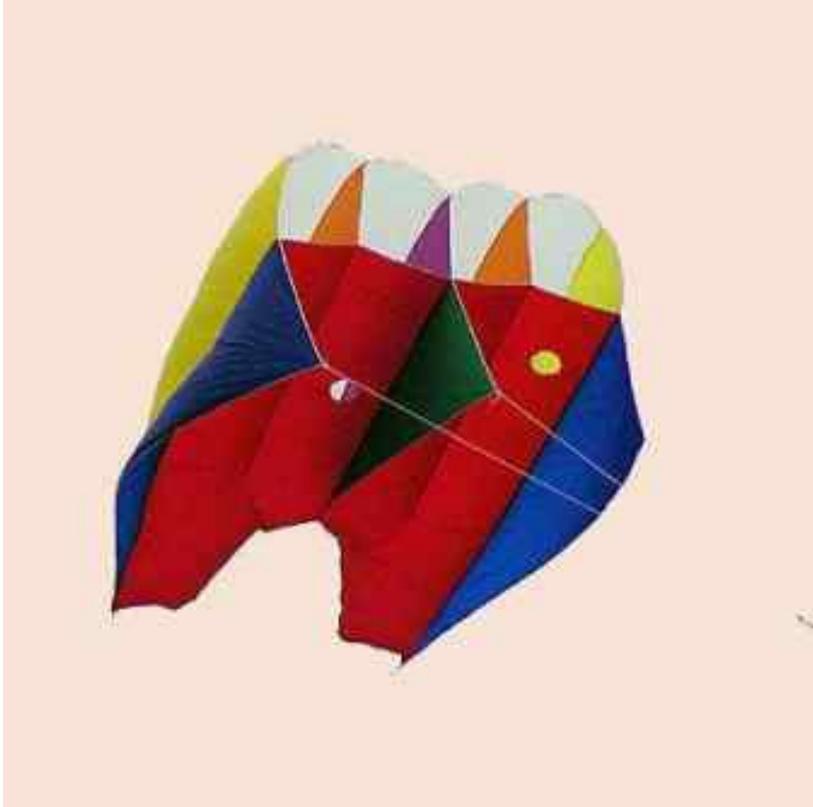
- **Key benefits:**
 - high lift (even in low wind)
 - simple and relatively cheap
 - highly portable (ideal for the field)



Kite Designs

- Modern designs require
 - High lift
 - Maximum stability
- What you **don't** want
 - agility
 - controllability

Flowform - soft kite ~£125

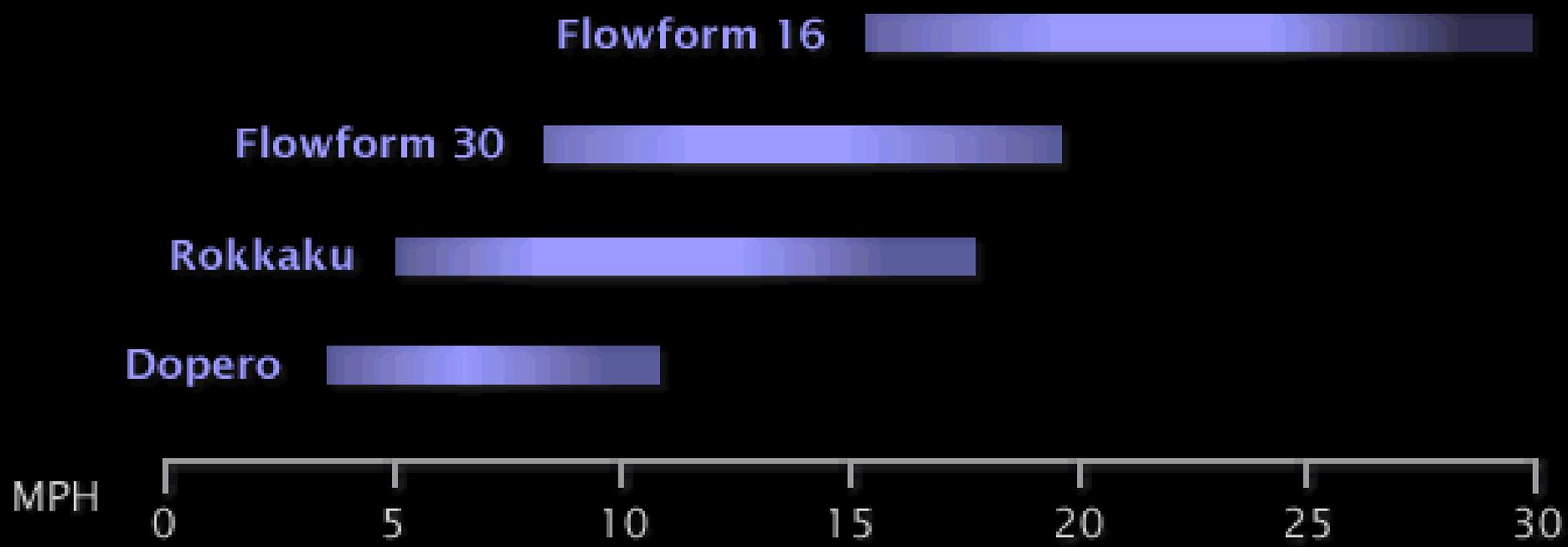


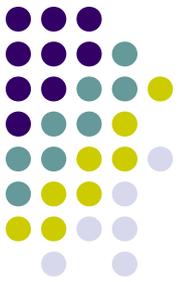
- Based upon foil type parachutes and developed over 30 years ago
- The deep cells and positioning of vents provides high lift and good stability

Dopero - framed kite ~£250



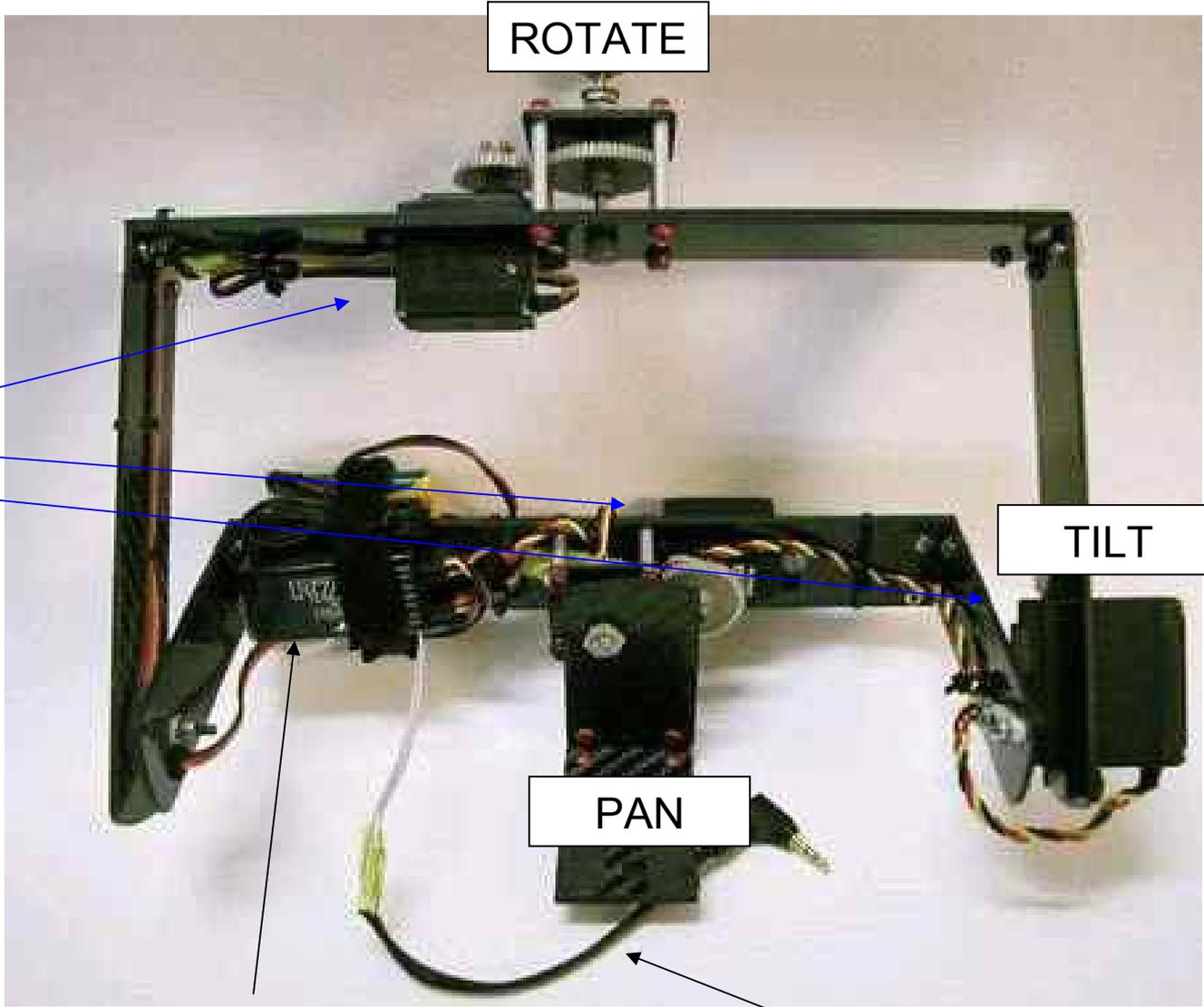
- Based upon a Pearson Roller, these provide good lift in *very* low wind conditions
- Has a higher flying angle than the soft kites and therefore good in tight spaces





Rig Design

- Inner/outer cradle design allowing full rotate, pan and tilt
- Suspension system (picavet) is used to attach the kite to the line
- Total rig cost: ~£250



ROTATE

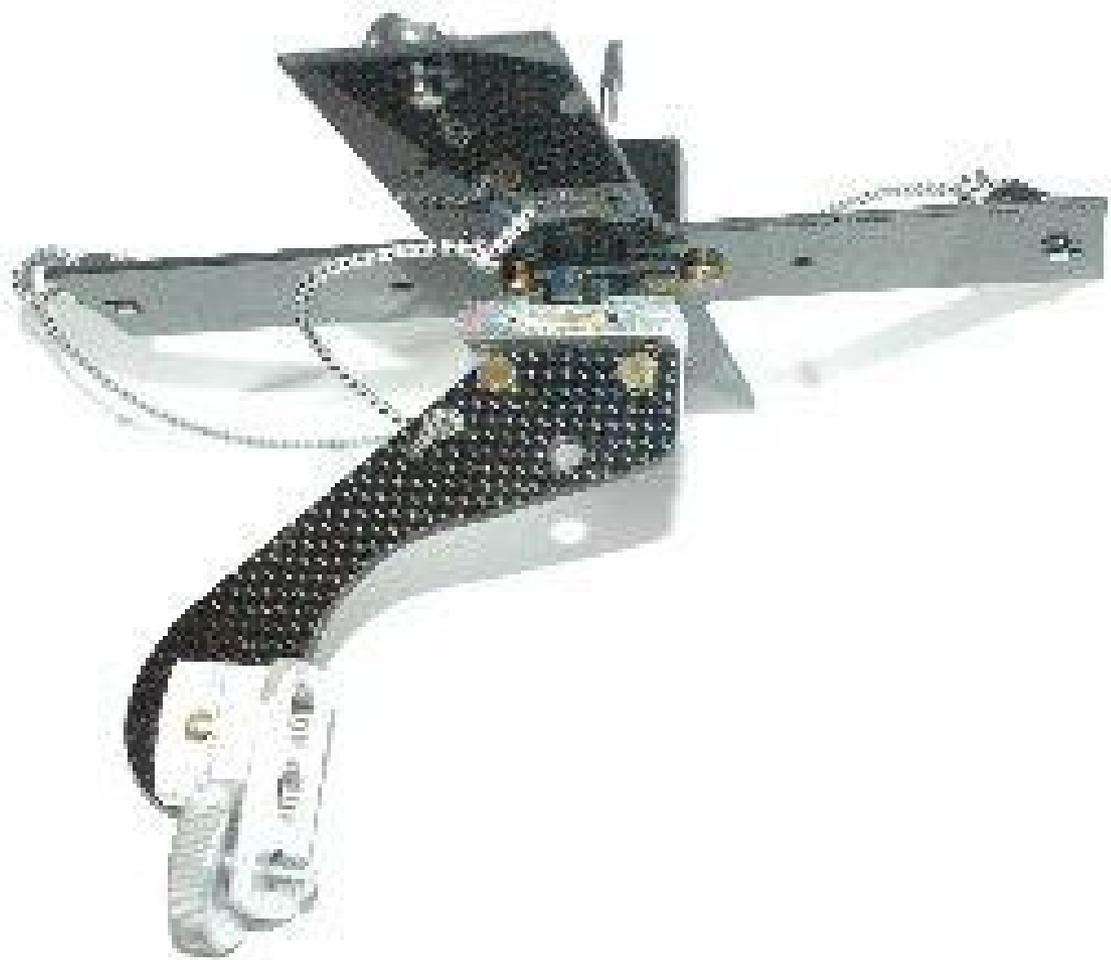
TILT

PAN

RX

Remote shutter release

servos









Sensors



Nikon D70 (~£500)

24mm lens (~£350)

Camera Specs

Image Size: 3008 x 2000

Shutter: 30s - 1/8000s

Image: RAW or JPG

Storage: Compact Flash 2Gb

“In aerial survey we have to take a large number of photographs to a set plan, from a moving platform, at a great height and at a low temperature.

Alone or collectively these conditions are foreign to most photography.

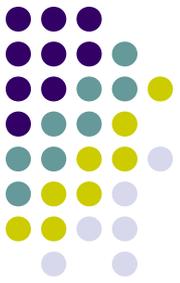
Despite this the photogrammetrist requires excellent definition of a low contrast object, further reduced by poor atmospheric conditions.”



Camera Techniques

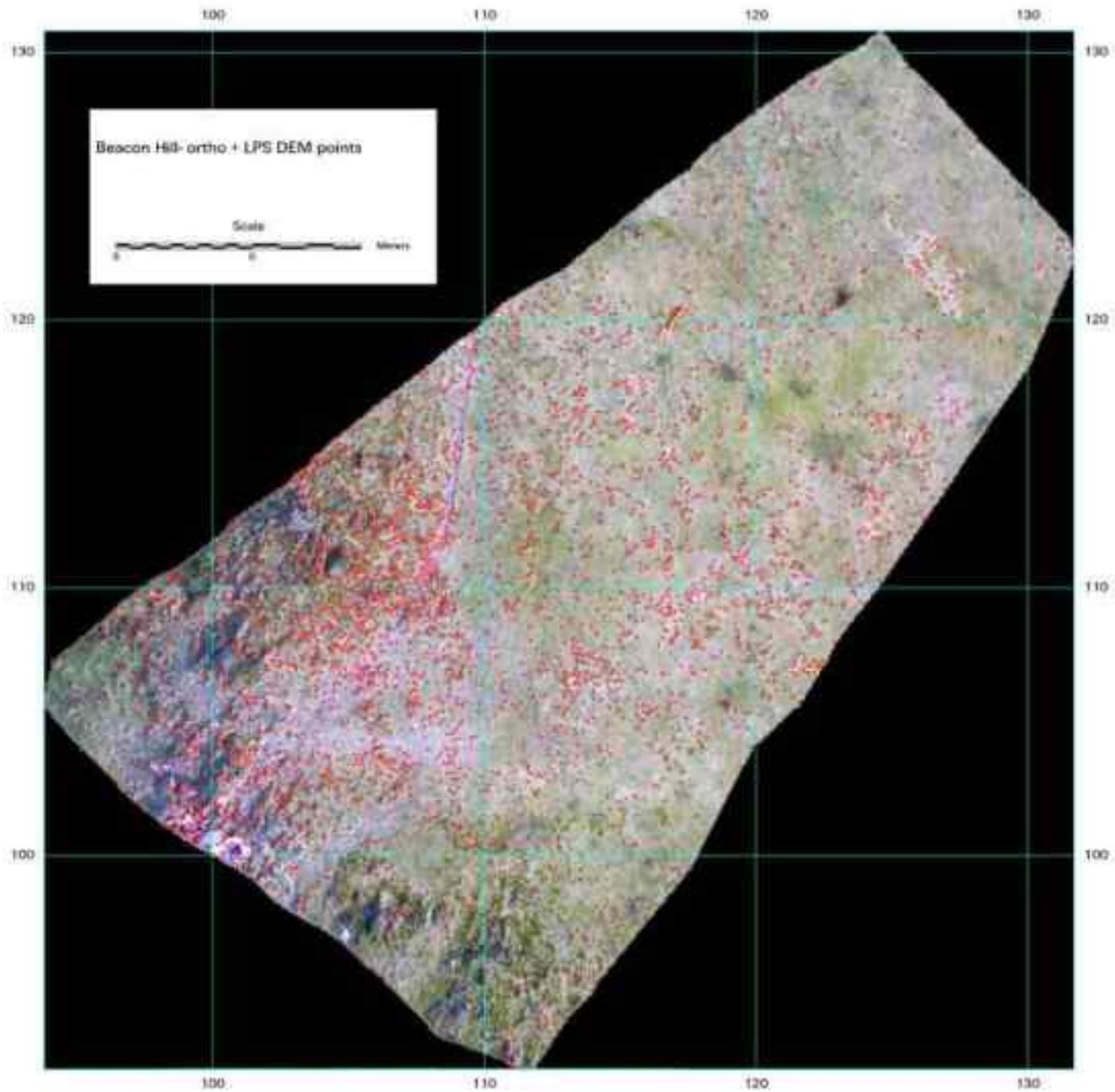
- **Need to acquire sharp imagery, under low light, from a moving platform**
- **Select** medium aperture (f8) to minimise lens distortion effects
- **Select** a fast shutter speed ($>1/500s$) to minimise motion blur
- AutoISO

Outputs

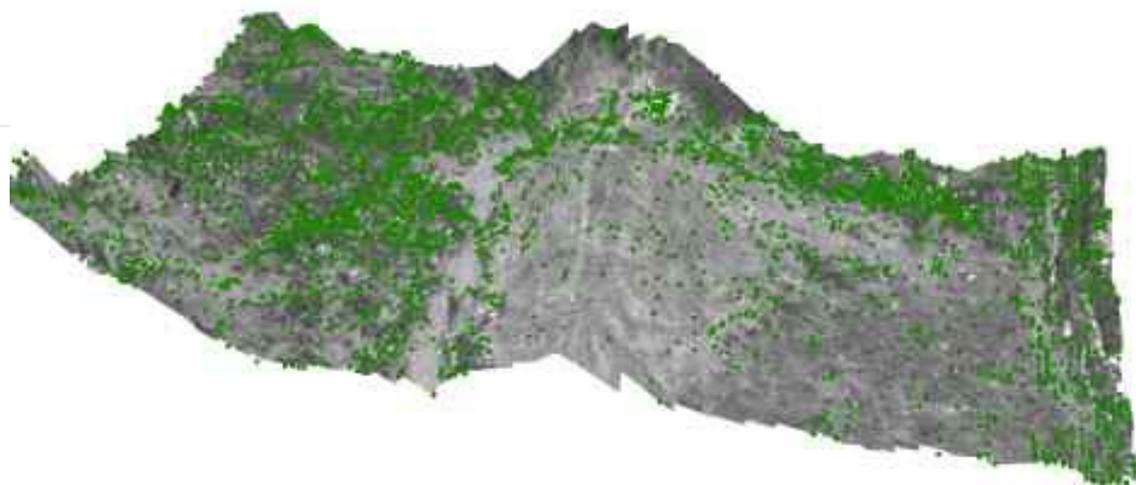
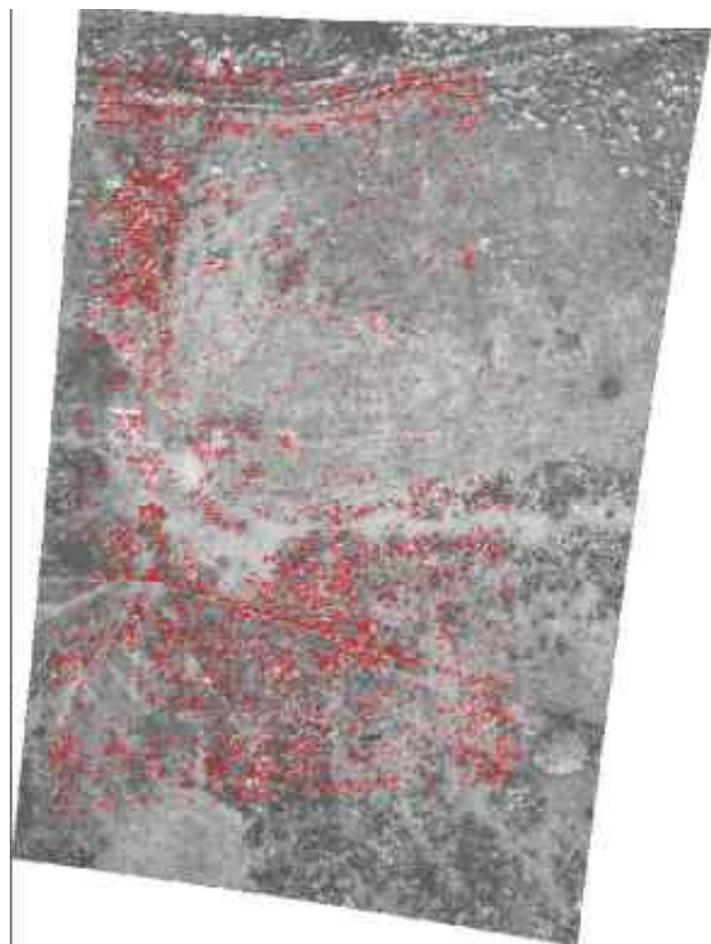


- Three data outputs:
 - 1: raw vertical/oblique imagery
 - 2: georeferenced vertical imagery
 - 3: orthophoto, DEM (aerial triangulation)





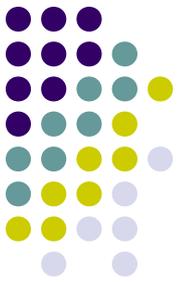






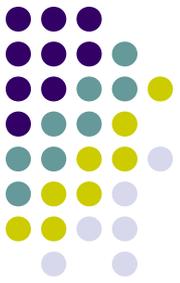
<http://www.flickr.com/photos/zandmotor/6208563470/sizes/o/in/photostream/>





Conclusions

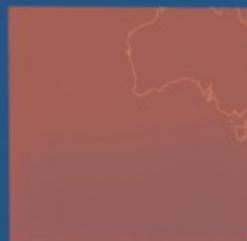
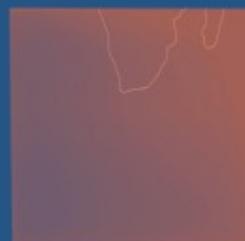
- Meso-scale RS increasingly important in geosciences
- KAP offers a solution: low cost, flexible, portable and accurate



The Future?

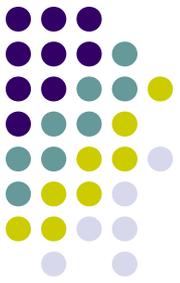
Two Key Benefits

- LAAP:
 - DEM generation: <2cm resolution
 - Multi-spectral acquisition
 - High temporal resolution



Questions?





References: KAP

- <http://www.kapshop.com/>
- <http://scotthaefner.com/>
- <http://arch.ced.berkeley.edu/kap/kaptoc.html>

Smith, M.J., Chandler, J. and Rose, J., 2009. High spatial resolution data acquisition for the geosciences: kite aeria I photography. *Earth Surface Processes and Landforms*, 34: 155-161.