The 8th Bilateral Geodetic Meeting Poland-Italy

Accuracy Evaluation of the SRTM Digital Elevation Model over Selected Sites in Australia and Brunei Darussalam

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Agenda

1. Objectives of the study
2. Characteristics of the Datasets
3. Methodology
4. Findings from the Australian Site
5. Findings from the Brunei Site
6. Conclusions

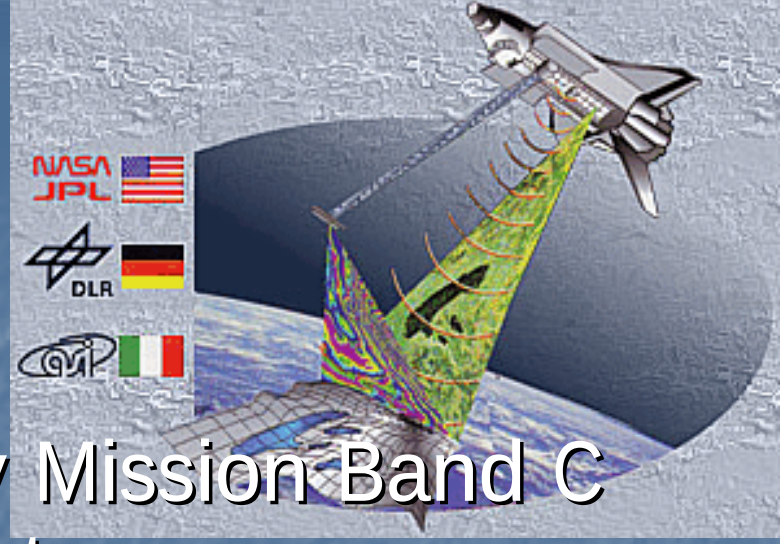
Objectives of the study

- To verify the accuracy parameters of the DEM-C provided by NASA/JPL,
- To identify a relationship between the type of land cover and the accuracy of the DEM-C over two significantly different test sites

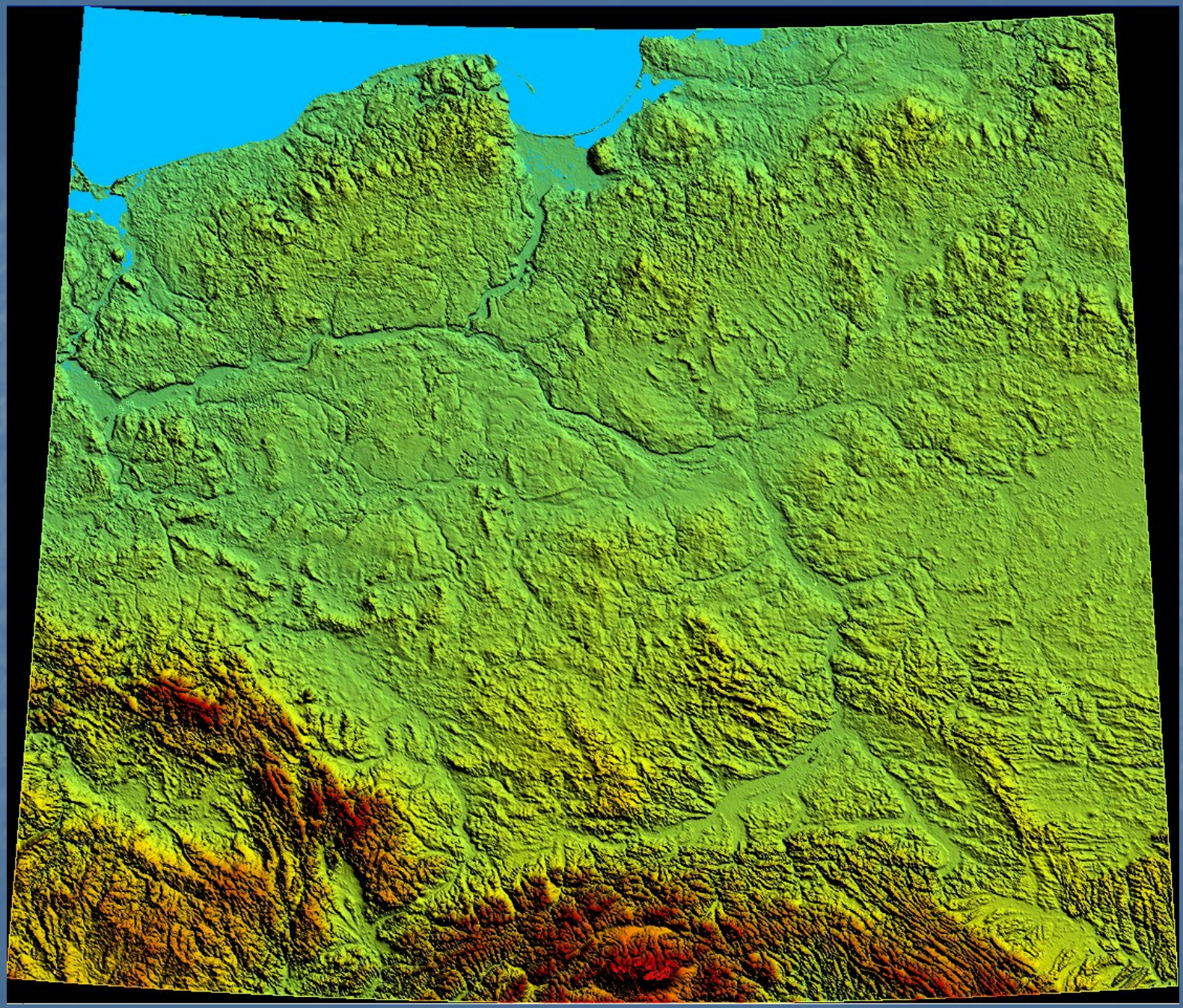
Characteristics of the Datasets

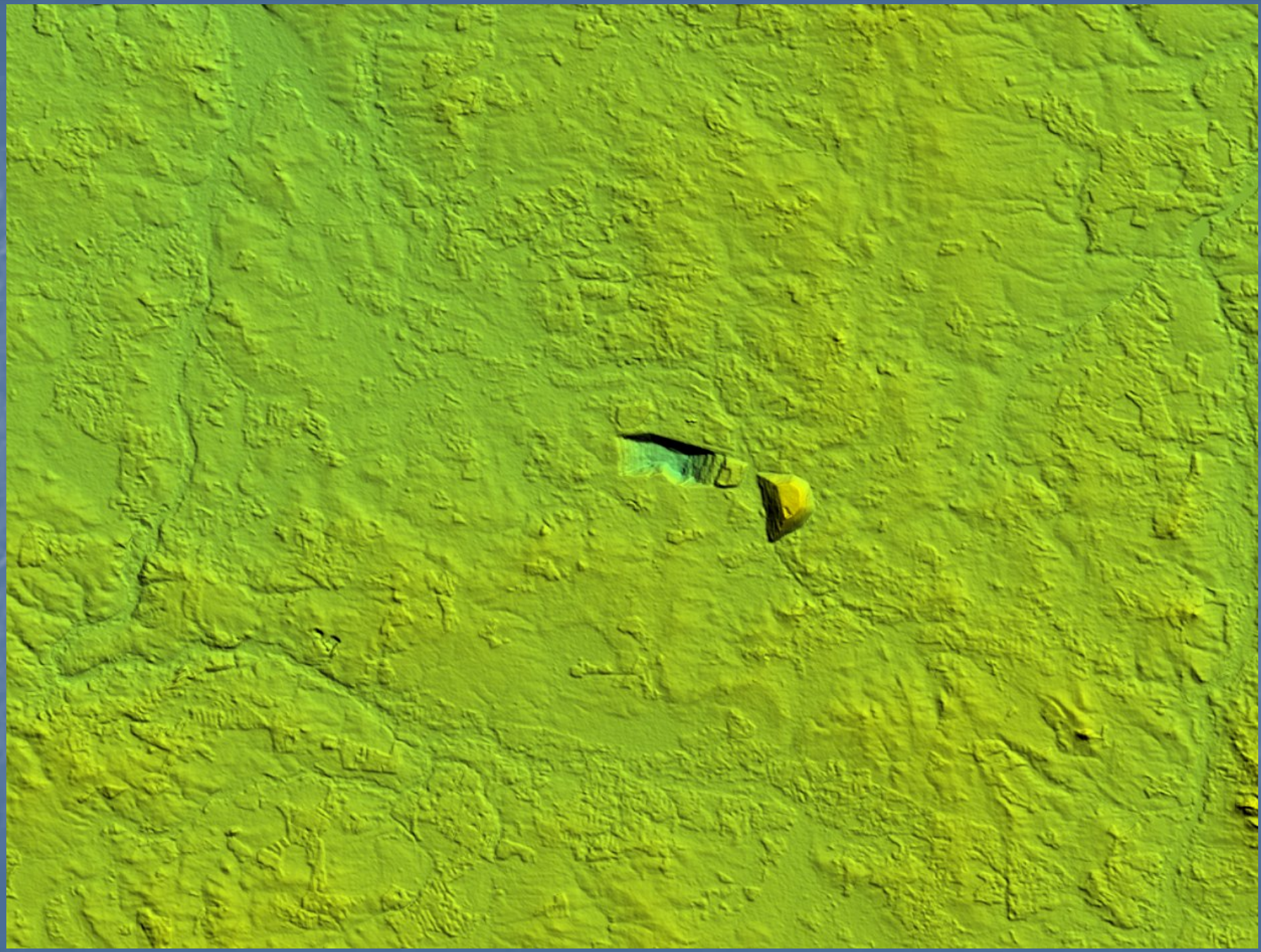
- 1:2.5k topographic maps including 1m contours and land cover classification (Australian site),
- SRTM Band C DEM (3”) over both sites,
- 1:200k forestry map of Brunei Darussalam,
- 15m contours derived from 1:50k topographic maps (Brunei site).

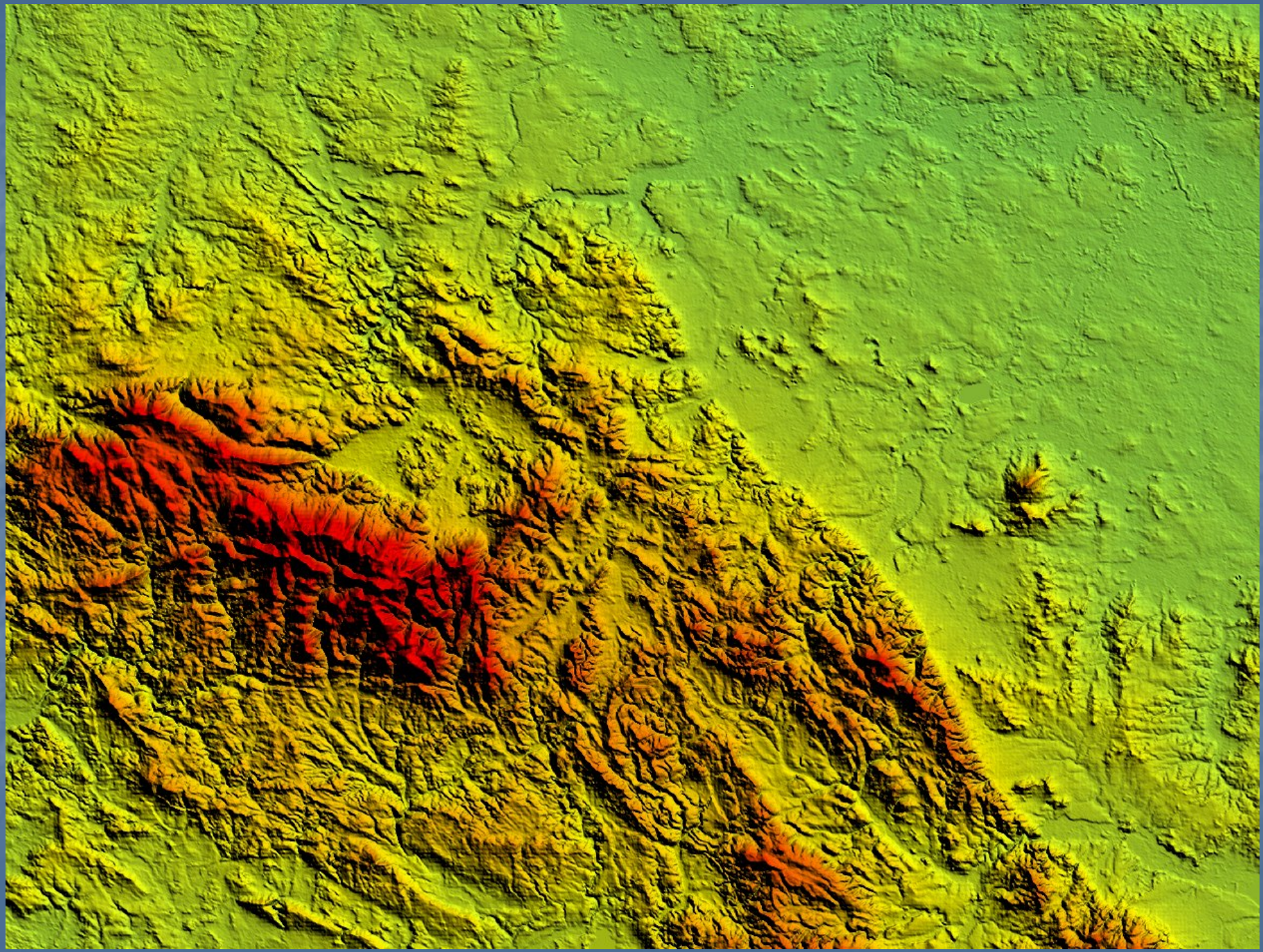
What is the SRTM Band C DEM?

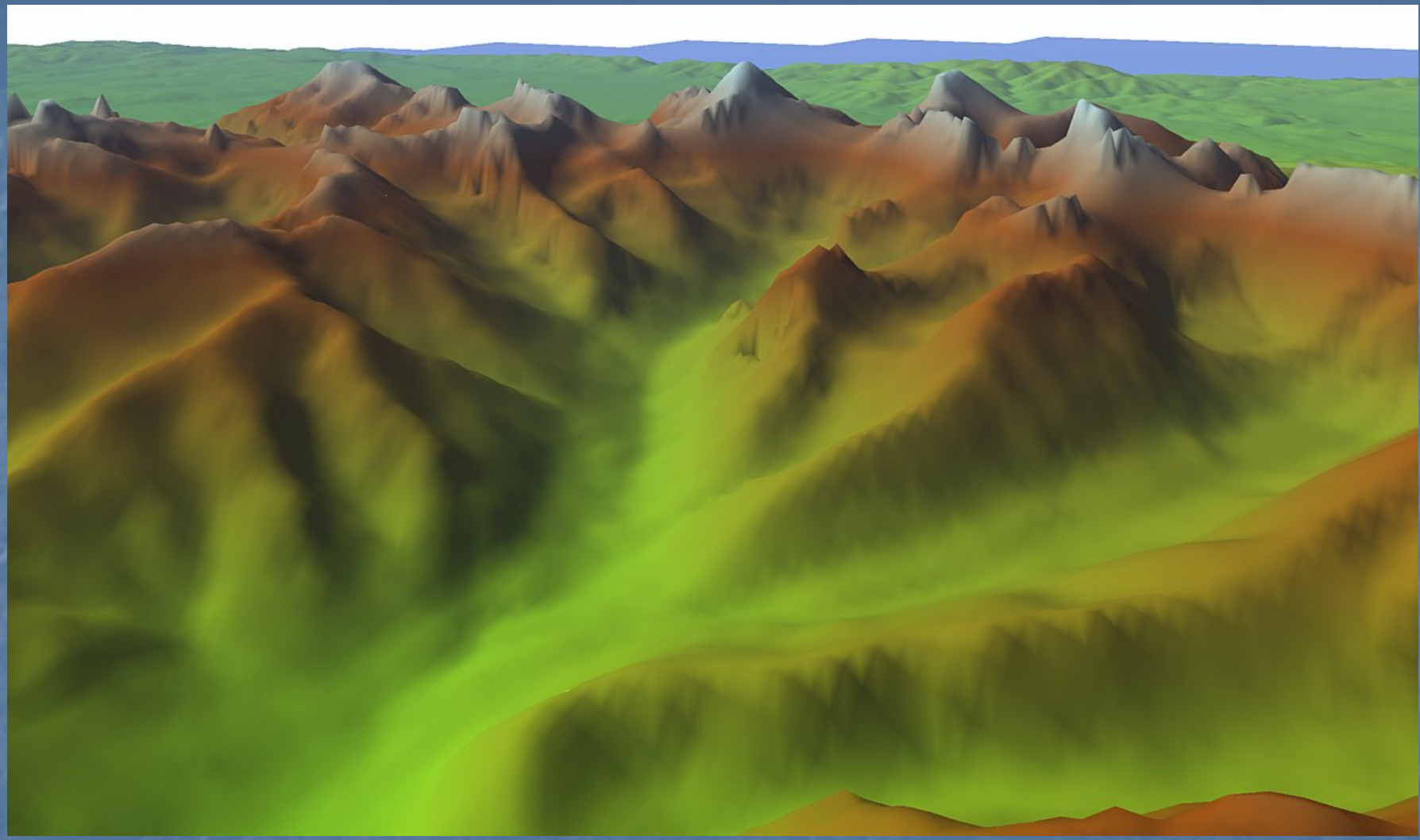


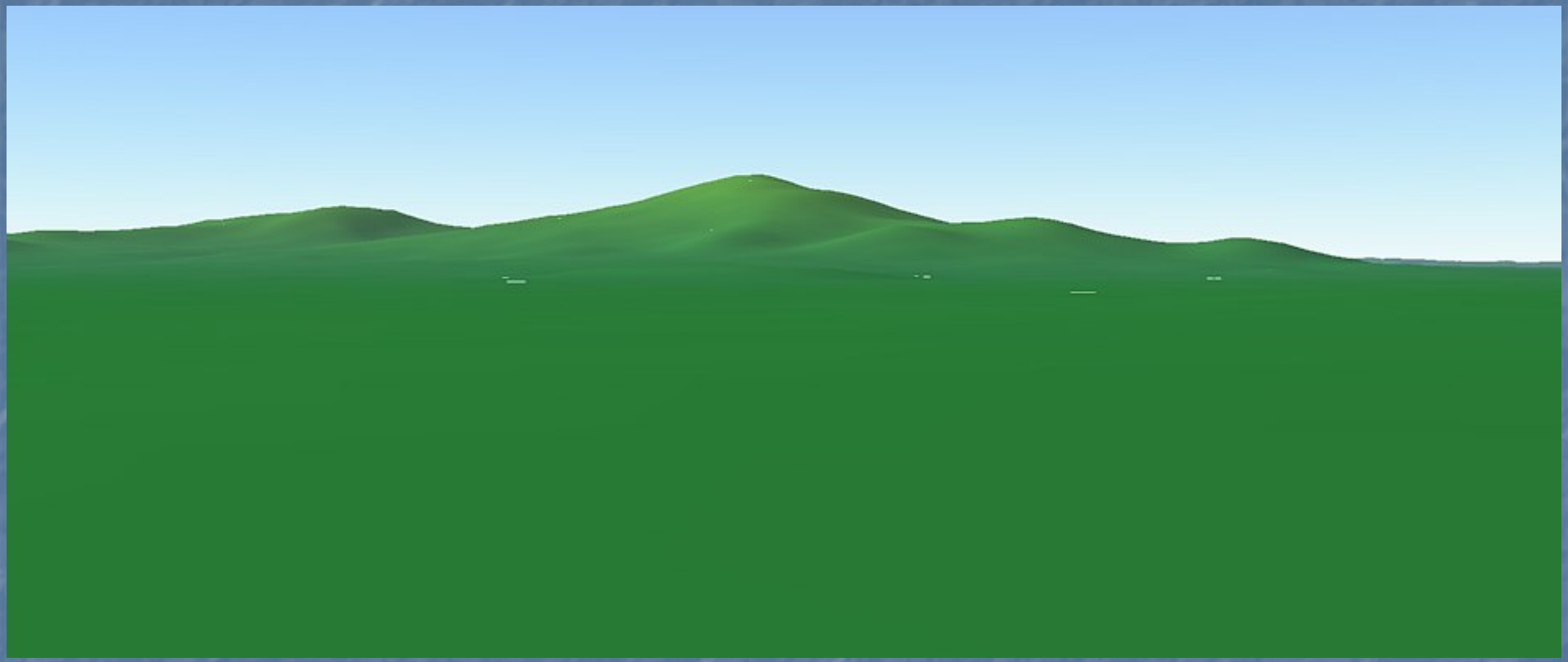
- Shuttle Radar Topography Mission Band C (5.6cm) or DEM-C for short,
- Acquired by the Endevour shuttle during 10 days mission in February 2000,
- Available for about 80% of land masses of the earth free of charge,
- Spatial resolution 3” (about 90m at the Equator); 1” for the USA,
- 1m quantization level;











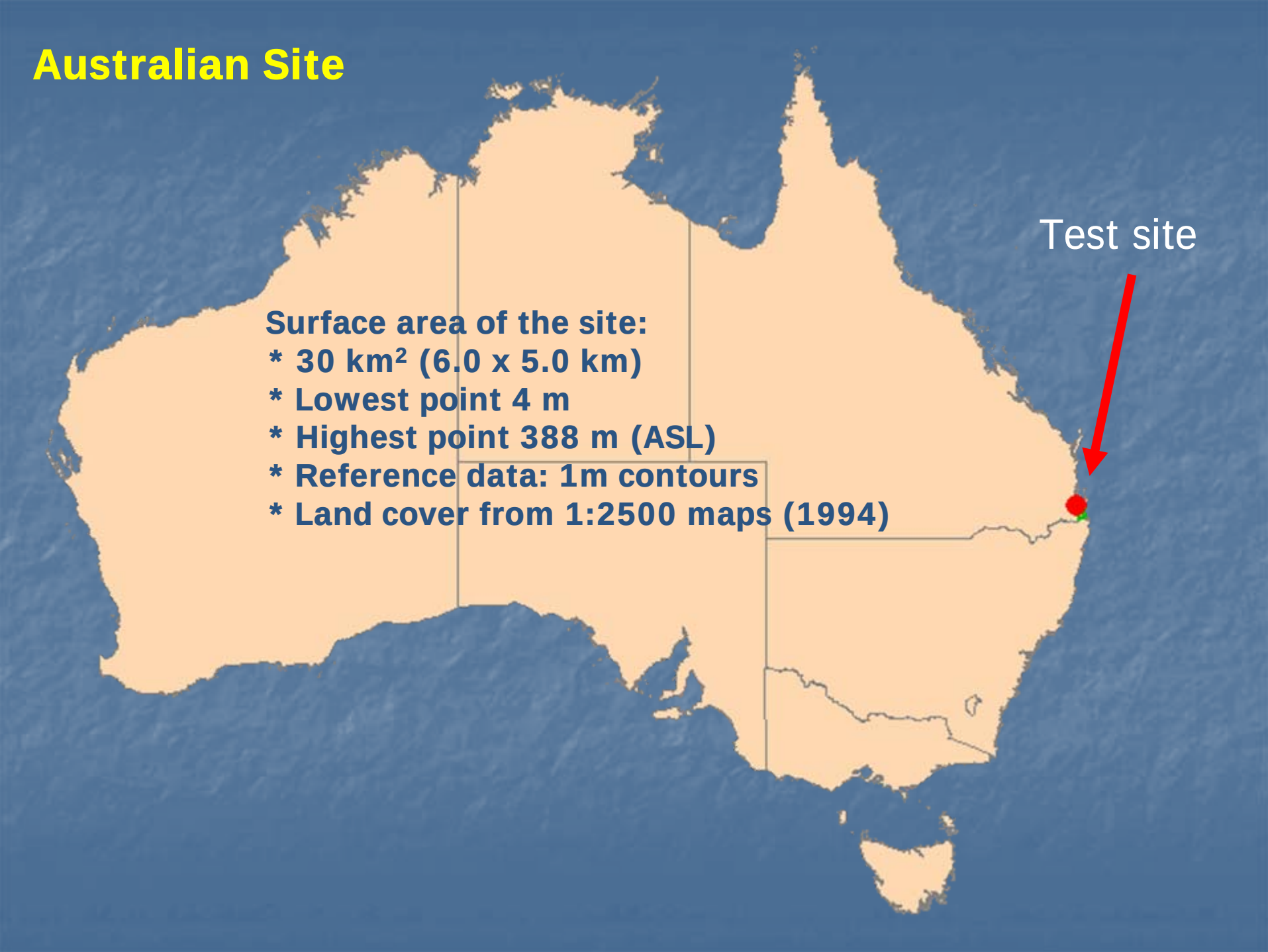
Accuracy of the DEM-C

(90 % confidency level – NASA / JPL)

Region/ Error Type	Africa	Australia	Euroasia	Islands	N. America	S. America
Absolute	5.6	± **6.0**	± **6.2**	8.0	9.0	6.2
Relative	9.8	± **4.7**	± **8.7**	6.2	7.0	5.5

Source:
Rodríguez E., Morris E. C., Belz J. E.,
A Global Assessment of the SRTM Performance.
Photogrammetric Engineering & Remote Sensing, vol. 72, no 3, 3/2006

Australian Site

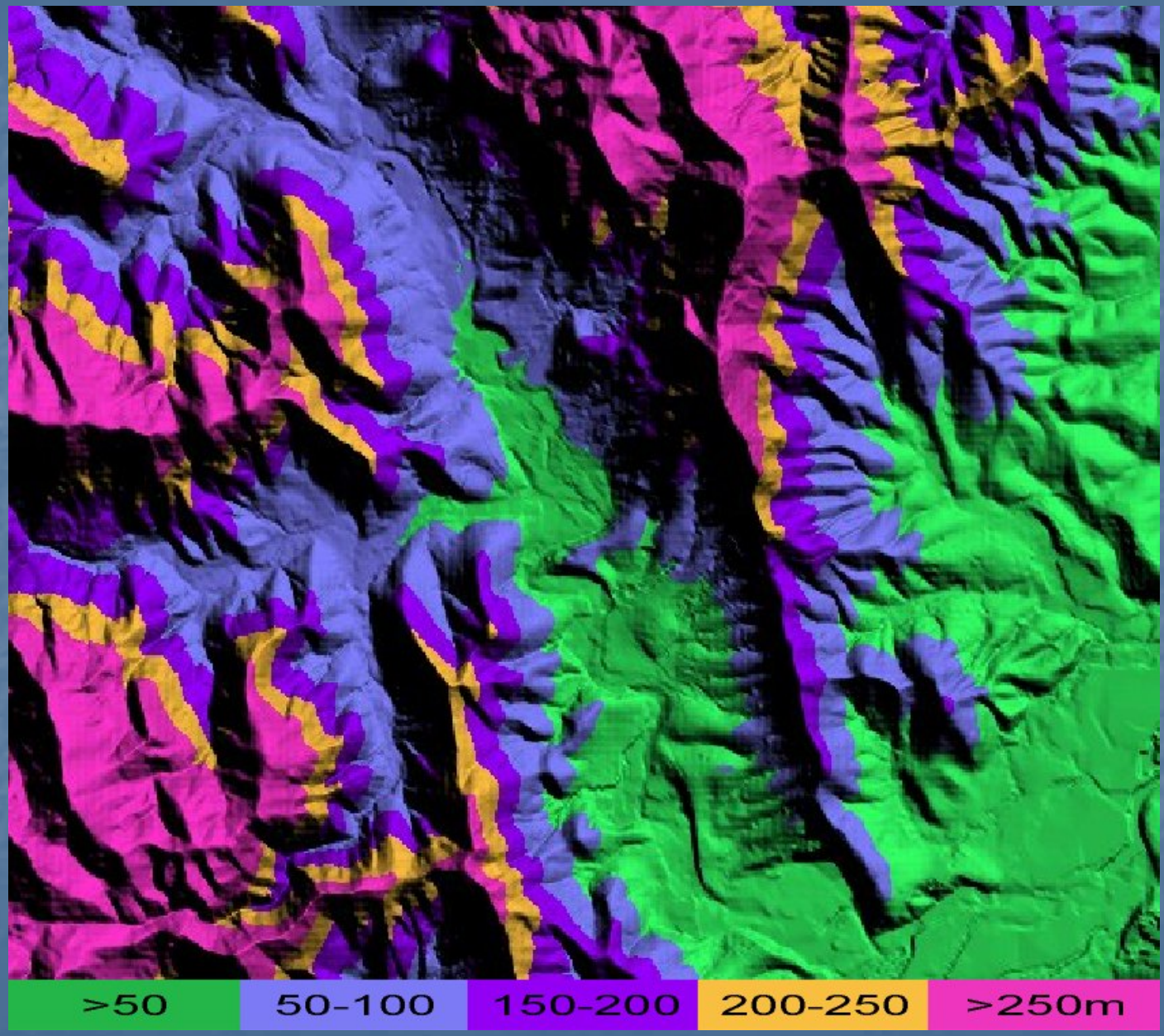


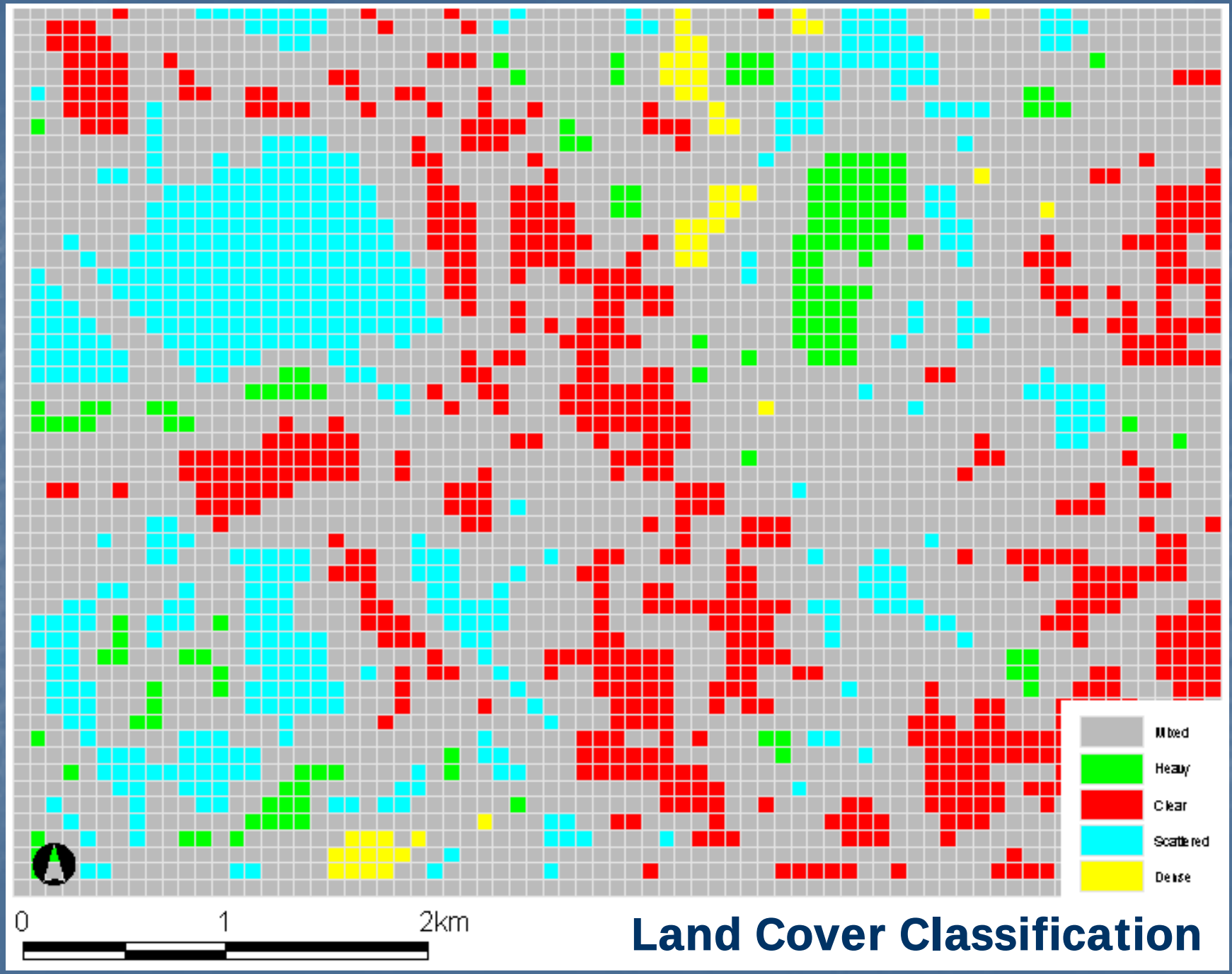
Surface area of the site:

* **30 km² (6.0 x 5.0 km)**
* **Lowest point 4 m**
* **Highest point 388 m (ASL)**
* **Reference data: 1m contours**
* **Land cover from 1:2500 maps (1994)**

Aerial Photo of the Australian Site

DTM over Australian Site





Land Cover Classification

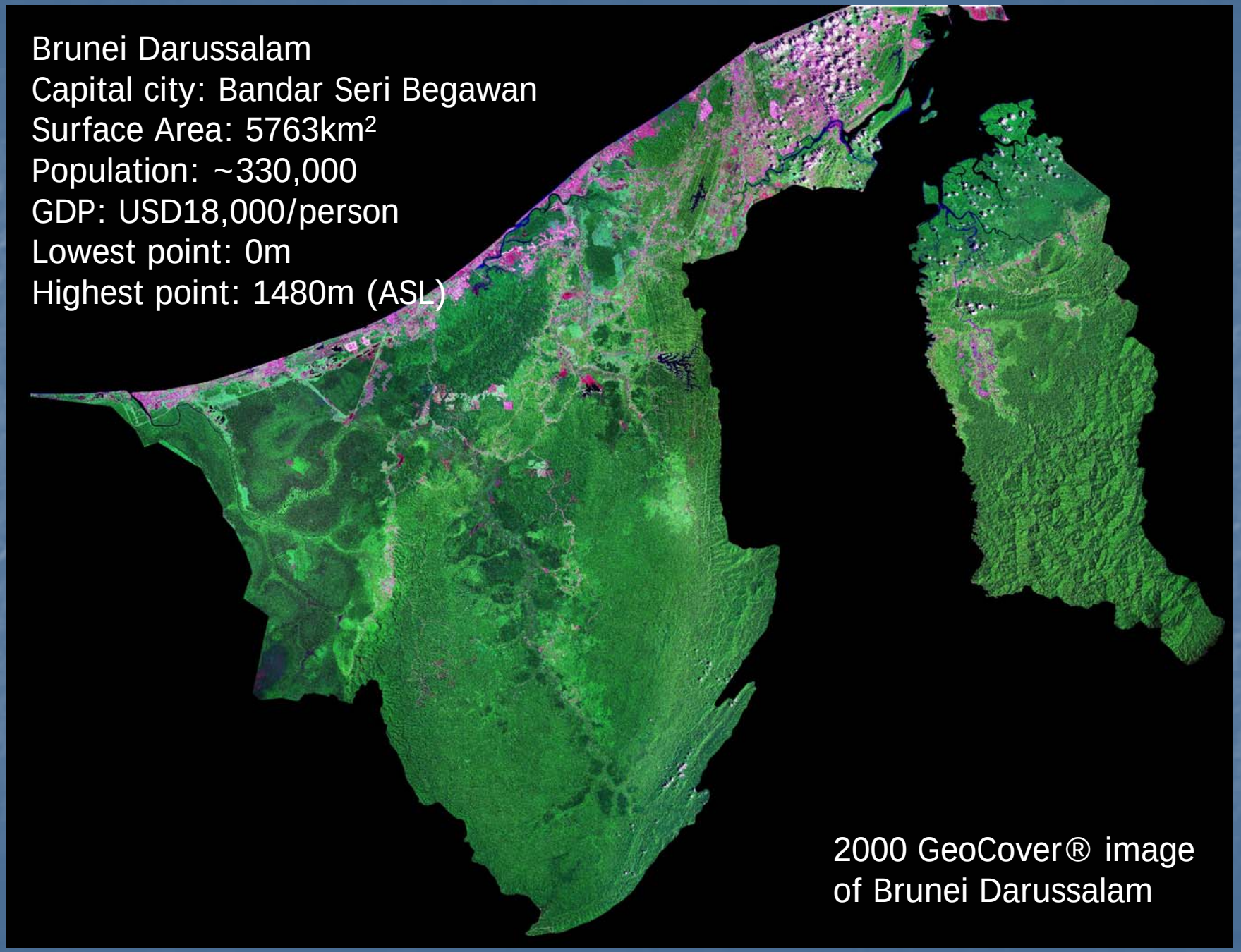
Results for the Australian Site

Type of cell	Diff.	Error	No. of Cells
Clear	2.9	± **4.2**	636
Scattered	14.6	± **9.1**	546
High	13.2	± **12.6**	163
Dense	18.1	± **9.1**	48
Mixels	10.0	± **11.0**	2559
All	9.8	± **11.5**	3952

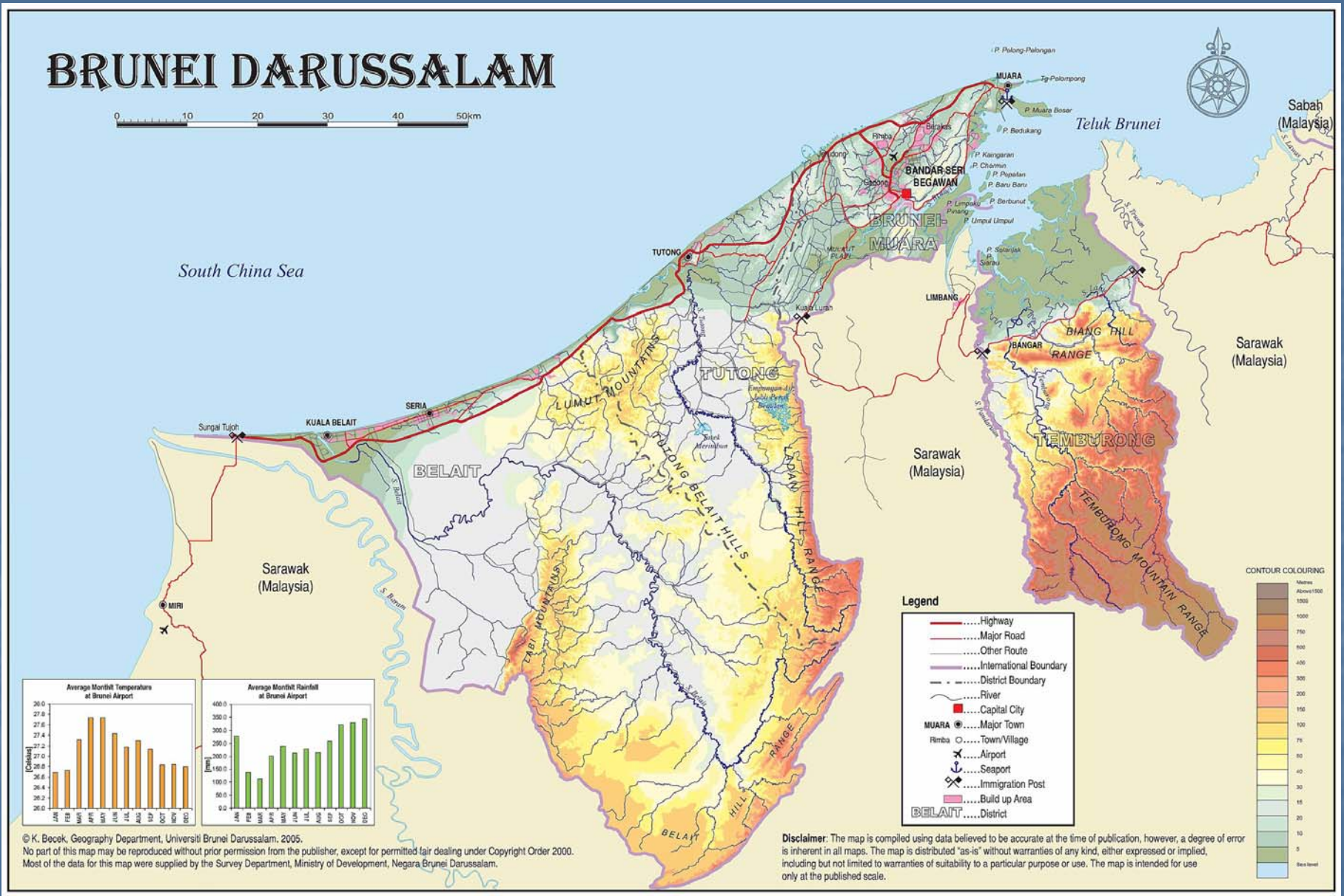
Diff. := DEM-C – $DTM_{(absolute)}$

Error := 1.6 x STD

Brunei Darussalam in Asia

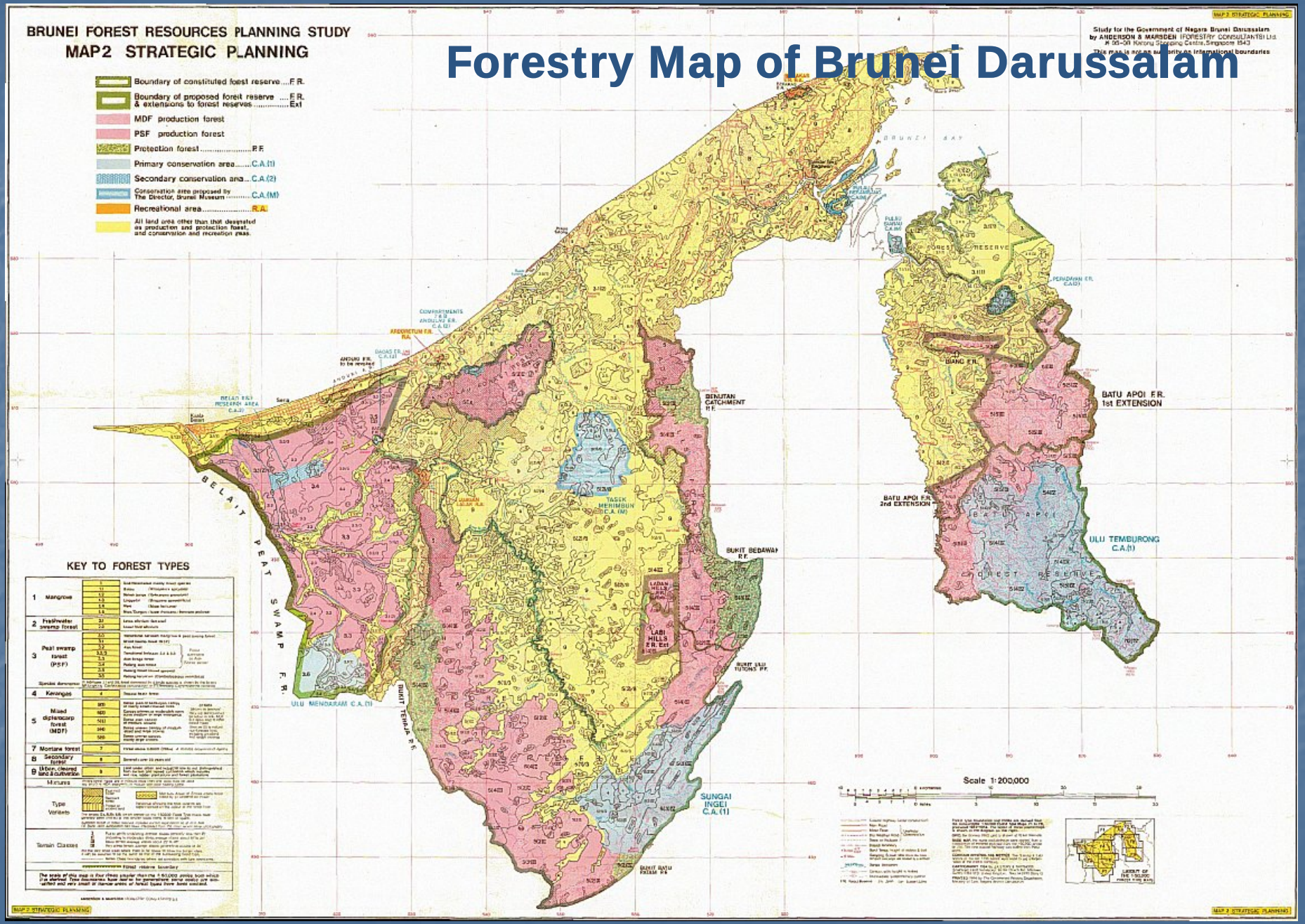

Brunei Darussalam
Capital city: Bandar Seri Begawan
Surface Area: 5763km^2
Population: ~330,000
GDP: USD18,000/person
Lowest point: 0m
Highest point: 1480m (ASL)
2000 GeoCover® image
of Brunei Darussalam

BRUNEI DARUSSALAM



Disclaimer: The map is compiled using data believed to be accurate at the time of publication, however, a degree of error is inherent in all maps. The map is distributed "as-is" without warranties of any kind, either expressed or implied, including but not limited to warranties of suitability to a particular purpose or use. The map is intended for use only at the published scale.

Forestry Map of Brunei Darussalam



Results for the Brunei Site

Forest Type	Diff.	Error	No. of Cells
4 Kerangas – Tropical health forest	7.4	± 13.4	36
5(1) Dense even, or semi-open, canopy of mainly small-crowned trees	4.7	± 10.6	29
5(2) Canopy uneven, or moderately open, some medium or large emergents	10.8	± 10.7	86
5(3) Dense even canopy of medium crowns	16.0	± 11.8	19
5(4) Dense uneven canopy, of medium-sized and large crowns	11.5	± 14.9	48
5(5) Dense uneven canopy, mainly large crowns	23.5	± 21.1	29
8 - Generally over 25 years old	4.7	± 10.6	118
9 Land under urban and industrial use	5.0	± 14.9	116

Diff. := DEM-C – $DTM_{(absolute)}$

Error := 1.6 x STD

Conclusions

- The accuracy of the DEM-C appears to be better than published for the Australian site (± 6m versus ± 4.2m),
- The corresponding values for the Brunei site are much larger than published (± 6m v. ± 14.9m). This is most likely due to the quality of the reference DTM for the Brunei site (15m contour interval),
- The vegetation cover courses a systematic, positive shift of the DEM-C in a range from 14.6 – 18.1m (Australia), and 4.7 – 23.5m (Brunei)
- Further tests are required to quantify a relationship between the vegetation type and systematic shift of the DEM-C.