Looking at the hydrological results from the Asu catchment in a wider context

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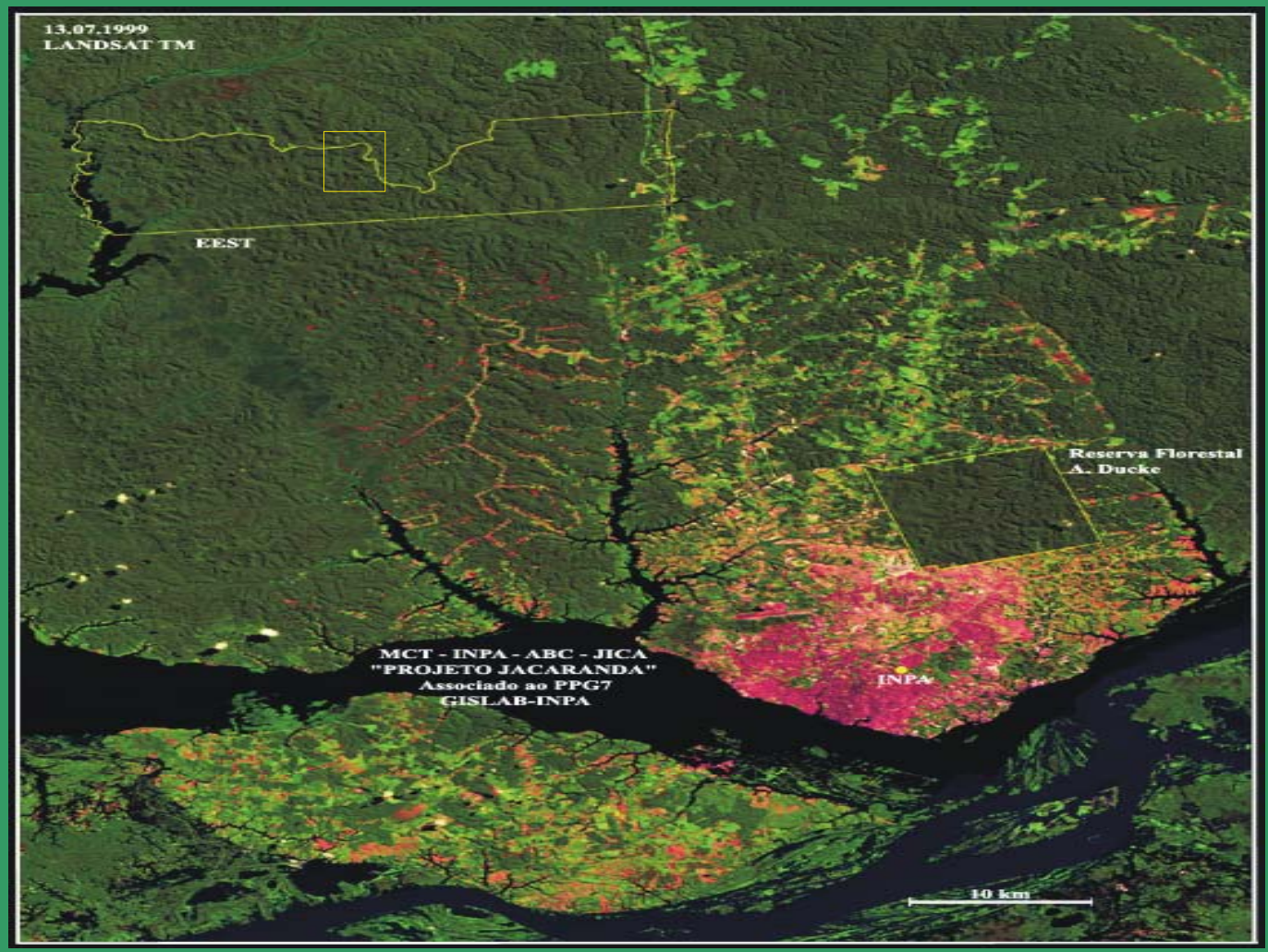
Asu catchment results examined in a wider context
Location (Landsat)



Asu catchment results examined in a wider context

Catchment information

Area:	6.8 km^2
Maximum elevation	95m asl
Maximum relief variation	~50m
Topography	Dissected plateau, slopes up to 30%
Mean annual rainfall	~2400mm
Dry season (=less wet season!)	June – September
Geology	Flat bedded unconsolidated sediments (sands and clays) of the Barreiras formation
Soils	Oxisols (85% clay) on plateau Deep sandy soils in valley, transitional on slopes
Vegetation	Terra firme forest (~180 species ha^{-1}, dbh >10cm)

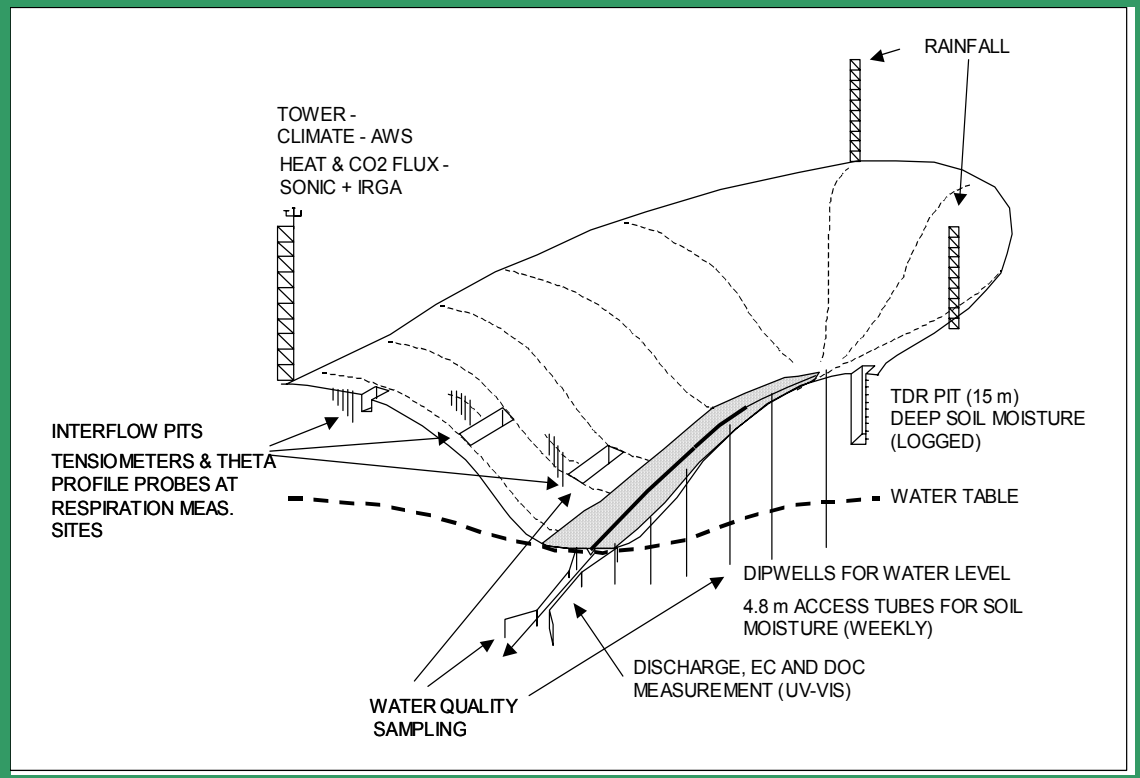
Asu catchment results examined in a wider context

Measurements

- Rainfall
- Runoff
- Groundwater storage
- Soil moisture storage
- Interception
- Evaporation fluxes
- CO_2 fluxes

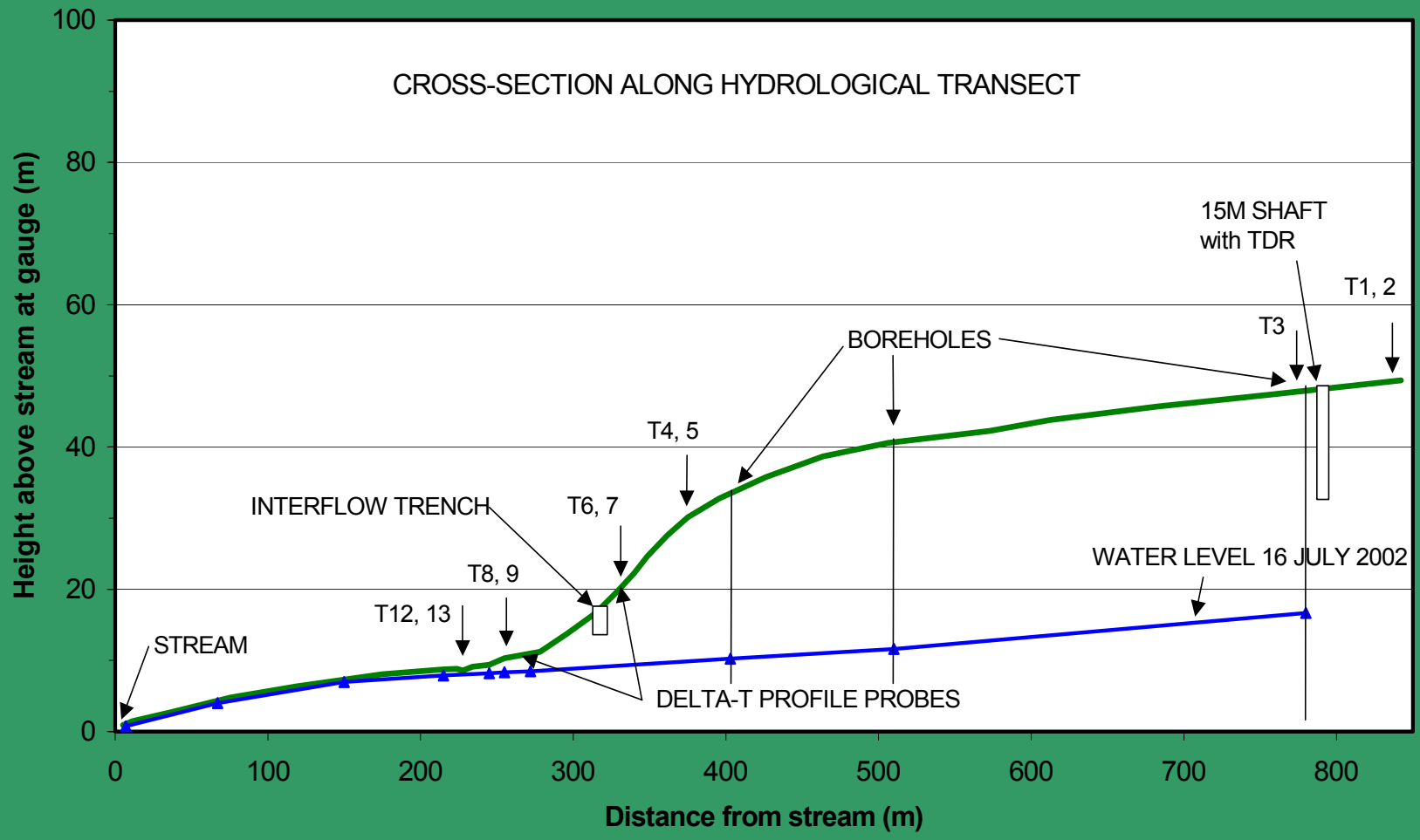
In streamflow, groundwater, throughfall

- DOC
- POC
- Nutrients
- CWD (coarse woody debris)



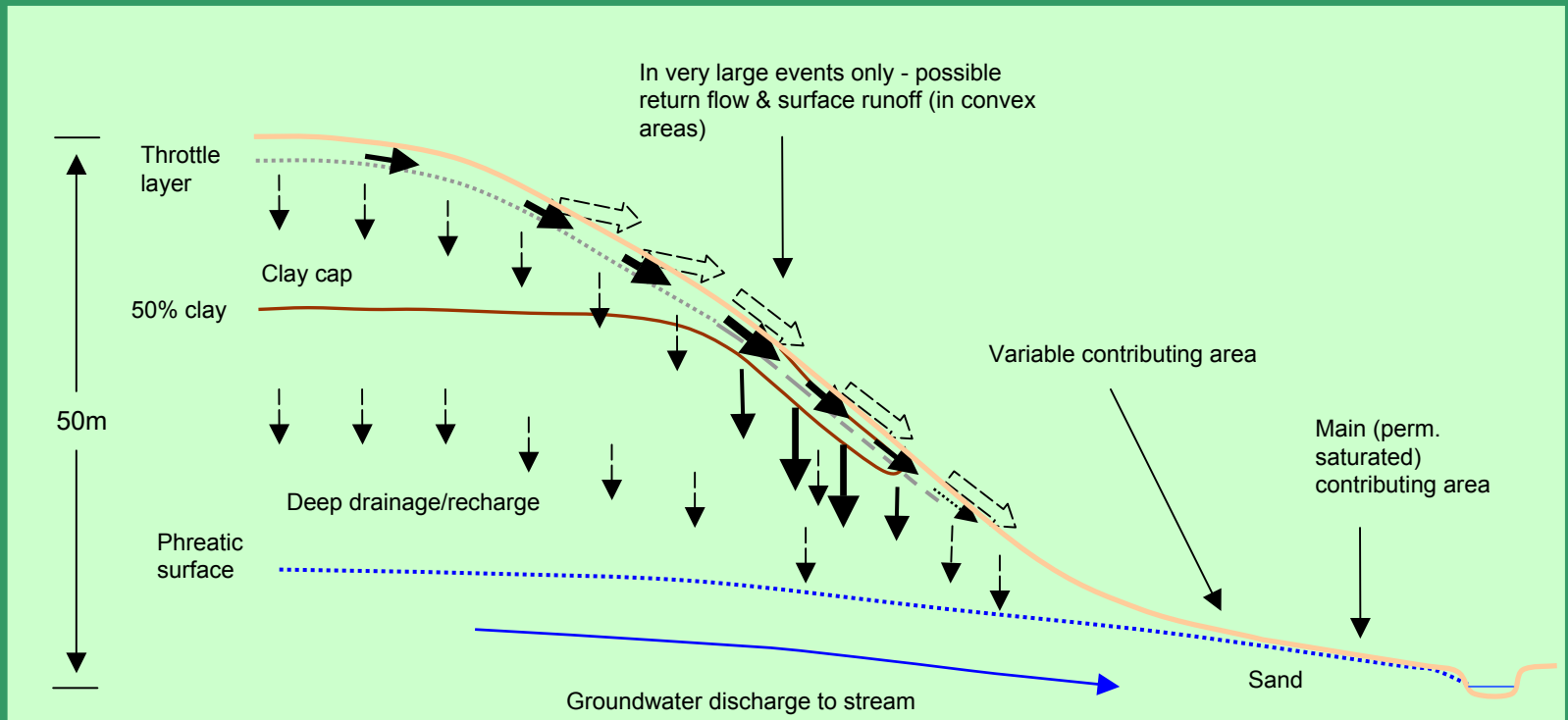
Asu catchment results examined in a wider context

Cross-section along hydrological transect



Asu catchment results examined in a wider context

Schematic diagram showing processes



Year	Rain (mm)	Baseflow (mm)	%	Stormflow (mm)	%
2002	2975	744	55	618	45
2003	2054	540	69	241	31

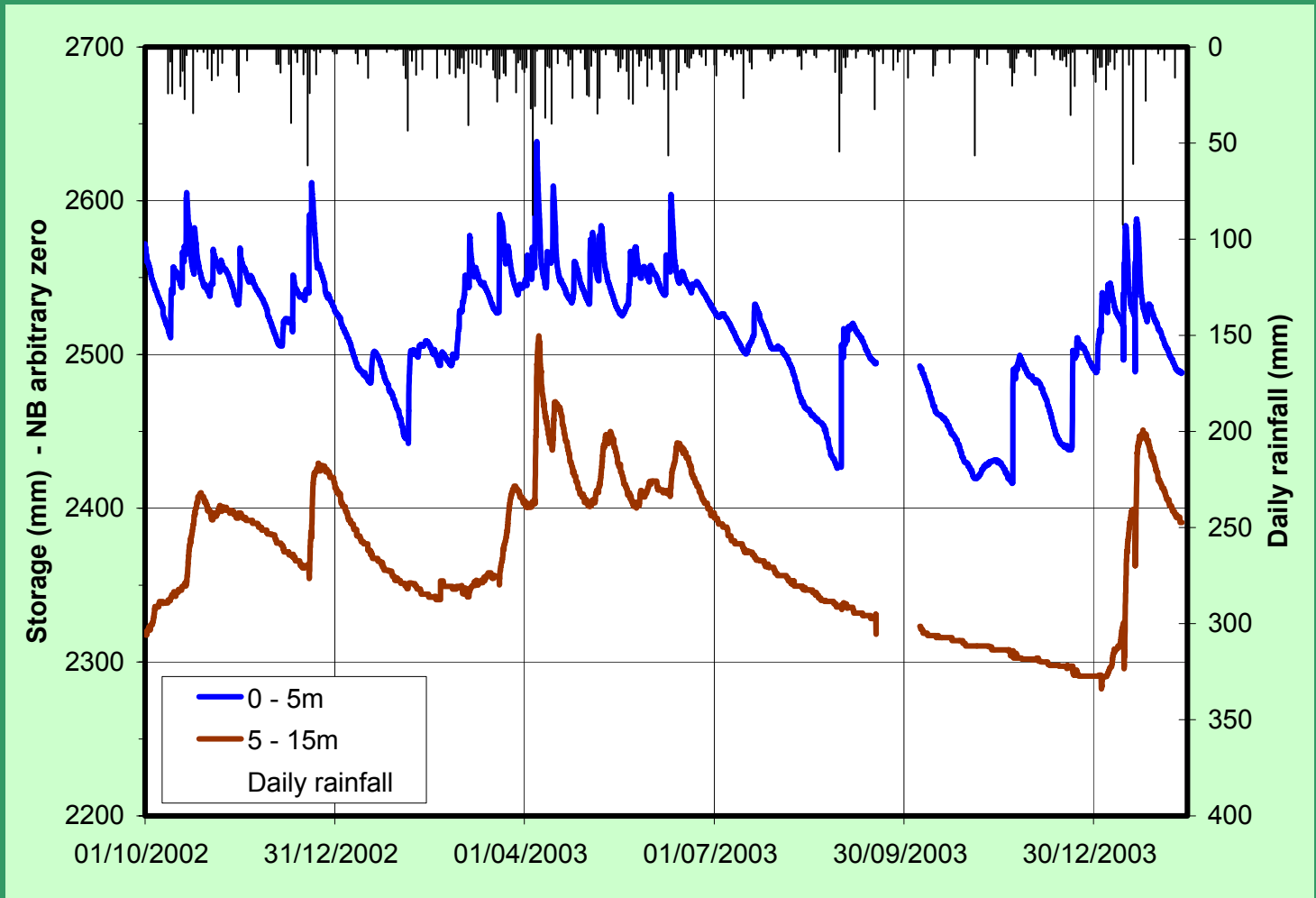
Asu catchment results examined in a wider context

Key features of Bacia Asu

- Deeply weathered and permeable catchment
- Large storage in deep unsaturated zone (up to 36 m deep)
- Large storage in saturated zone
- Long time constant of drainage from this storage
- Valley floor area ~35%
  - kept near saturation by ground water discharge
  - main source of storm runoff (& DOC)
- Baseflow has very little DOC
- Some evidence of contribution from slopes (in v. large events)

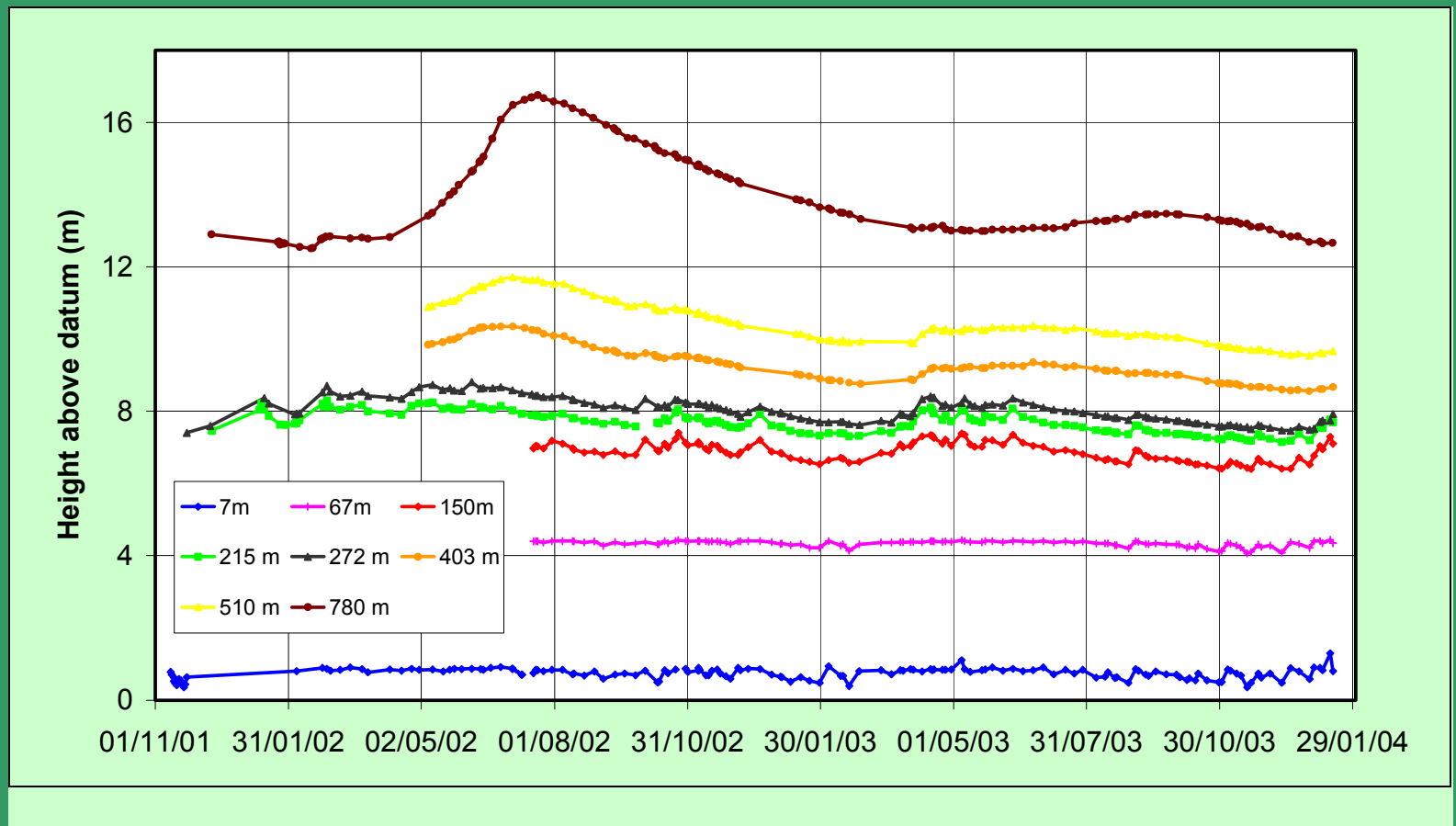
Asu catchment results examined in a wider context

Moisture storage changes beneath the plateau



Asu catchment results examined in a wider context

Storage in saturated zone - Groundwater levels at different distances from the stream



0 – 230m - valley floor
272 m - foot of slope
403 – 780m - plateau

Asu catchment results examined in a wider context

Relation of stormflow to catchment area for studies near Manaus

Catchment	Years	Area (km^2)	Annual rainfall	Stormflow (%)	Source
Calado	1984-85	0.23	2870	5	Lesack (1993)
Barro Branco	1981	1.3	2312	9	Leopoldo et al.(1995)
	1982	1.3	2365	9	
	1983	1.3	1949	9	
Asu	2002	6.8	2975	45	Hodnett et al. (2004)
	2003	6.8	2054	31	

Asu catchment results examined in a wider context

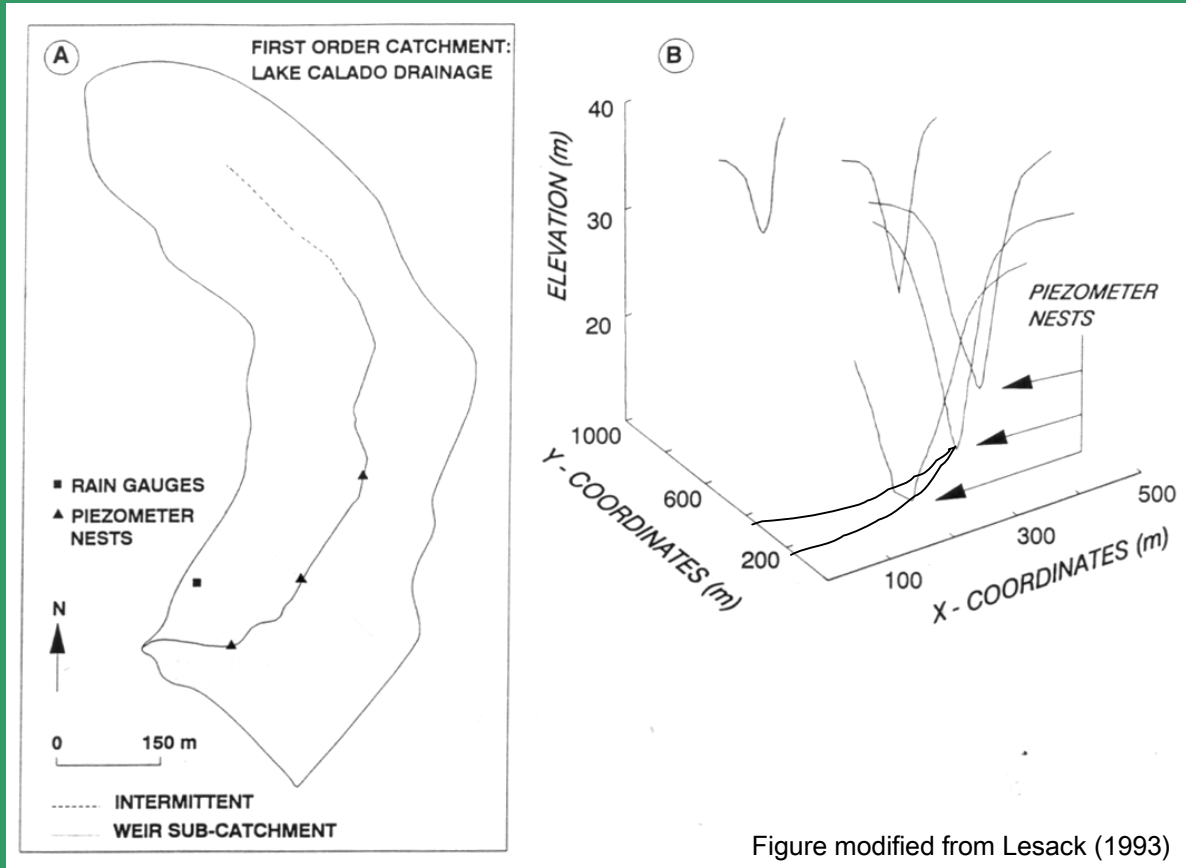


Figure modified from Lesack (1993)

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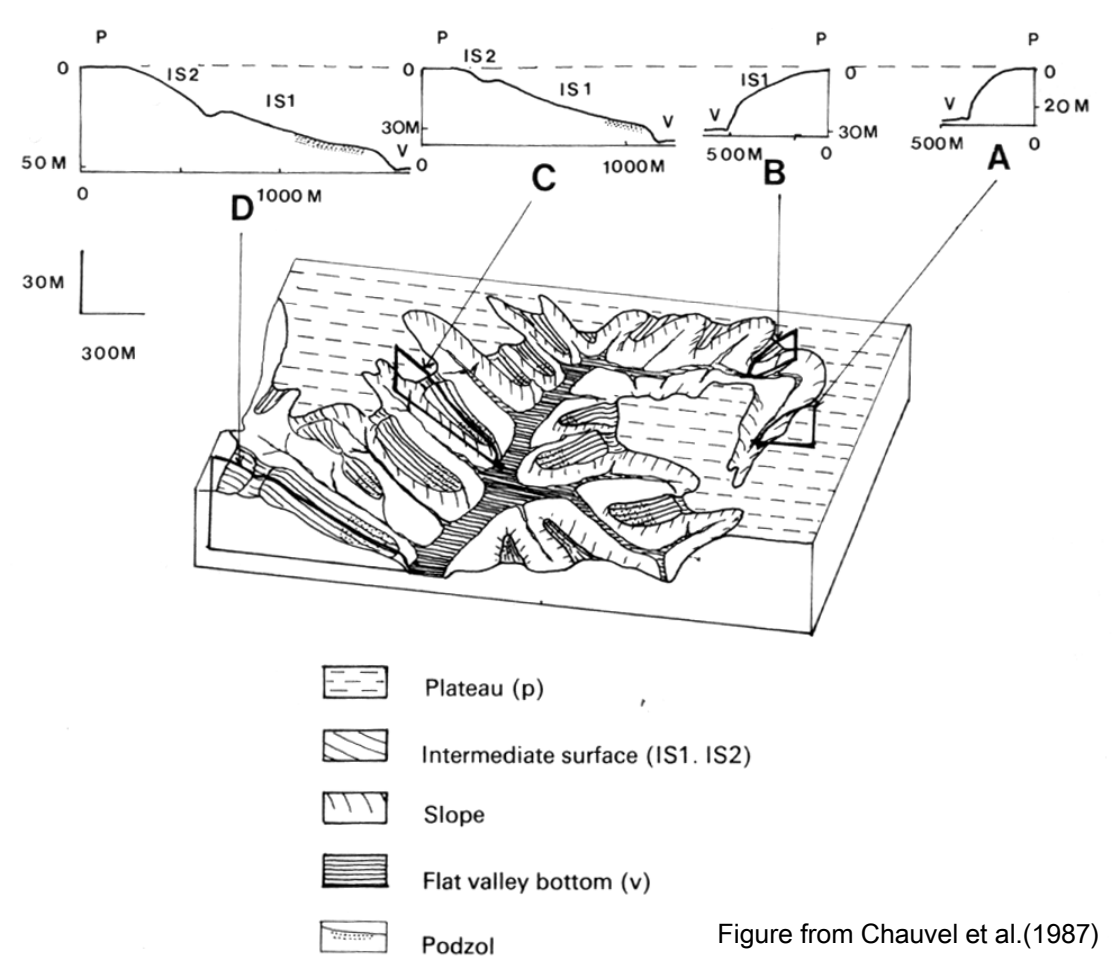
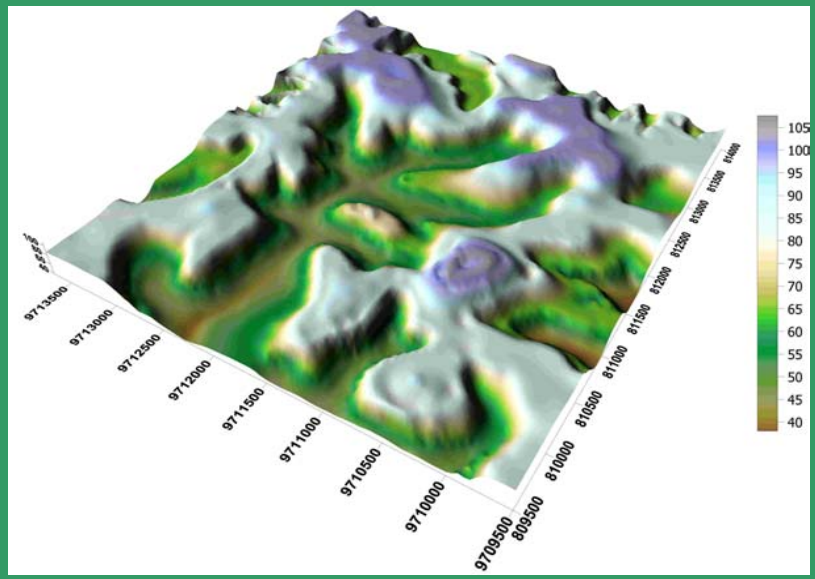


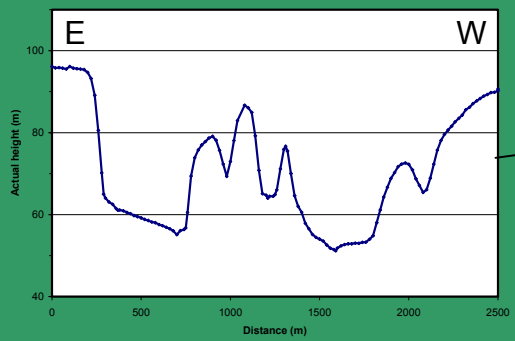
Figure from Chauvel et al.(1987)

Asu catchment results examined in a wider context

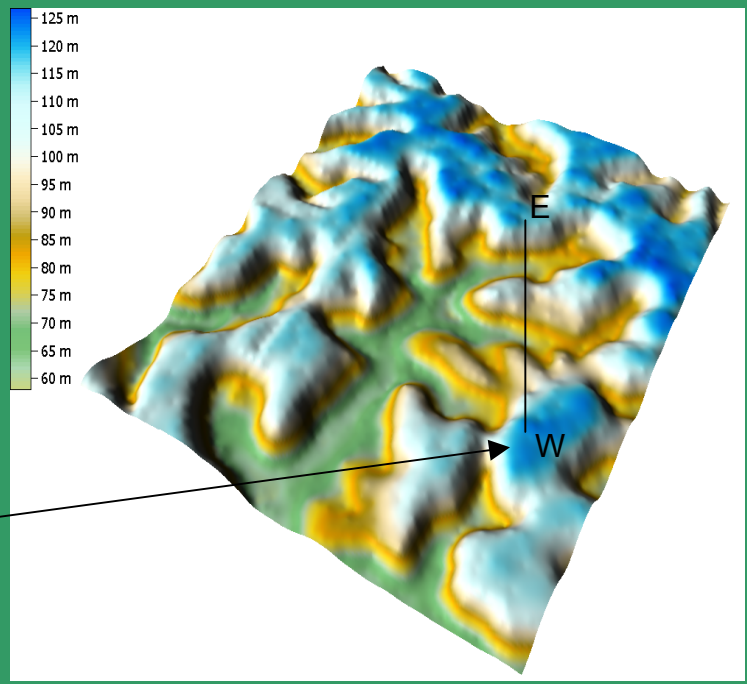
Catchment form – DEMs from map and shuttle radar

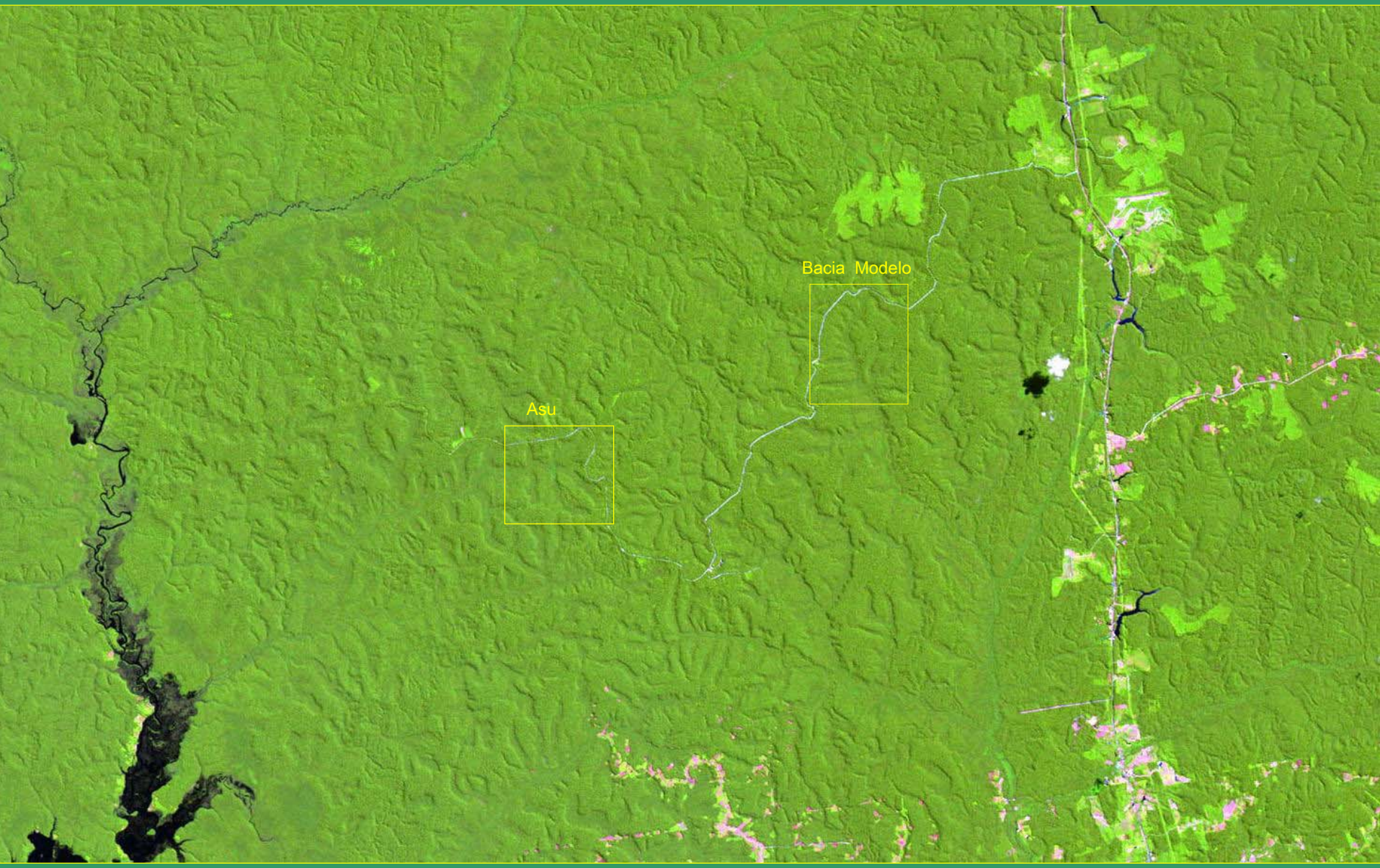
Digitised topog. map MI 517/2





Shuttle X-SAR Radar




Bacia Modelo
Asu

Asu catchment results examined in a wider context
Conclusions

- Results apply to deeply weathered permeable catchments
- Balance between storm flow and baseflow depends on proportion of catchment area which is valley floor with a shallow watertable
- Results from very small catchments cannot be scaled up directly without taking this into account
- Interflow / return flow on slopes may depend on presence of "clay cap" – not known how widespread this is
- Much geomorphological variation on the Barreiras sediments N of Manaus – range of valley forms in different areas.

Asu catchment results examined in a wider context
Results continued

- In areas with a shallow depth of weathering:
  - much less storage
  - less baseflow (quantity and duration)
  - soil / weathered zone may fill to the surface creating very large contributing areas