

# Tropics & Sub-Tropics

Data Rich Situations



# 1. Differentiating the Tropics

- ▶ Humid tropics
  - High rainfall intensity and depth
  - Strong seasonal rainfall regime
  - Seasonally h
  - ydrophobic soils
  - High surface runoff components (?)
  - High sediment loads
- ▶ Semi-arid tropics
  - ?

# 2. Issues


## ▶ General

- Data availability and reliability.
- Lack of centralised water resource management (in many areas).
- Ecological water requirements.

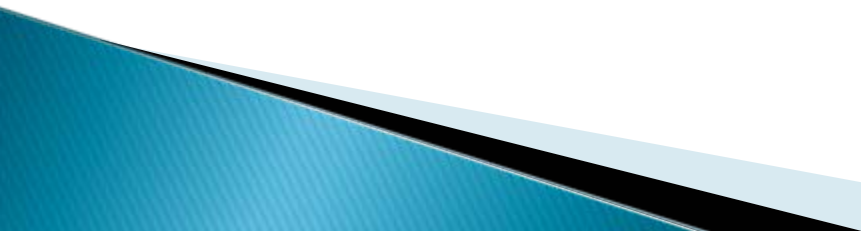
## ▶ Humid Tropics

- Large scale land use change – afforestation to agricultural:
  - Changes in seasonal distribution of runoff and effects on water use (social, ecological, effluent dilution, etc.).
  - Feedback loops to climate modification(?)

## 2. Issues (cont'd)

- ▶ Semi-arid tropics:
    - Drought frequency prediction.
    - Longer time scales (decadal).
    - Yield from water resources schemes (reservoirs).
    - Combined use of surface and ground water.
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# 3. Data rich areas

- ▶ Not many for humid tropics:
    - Limited to a small number of well resourced areas:
    - Hawaii, Puerto Rico, Costa Rica, NE Queensland, Borneo, parts of Brazil (possibly).
  - ▶ Semi-arid tropics:
    - Australia, S.W. USA, N. Mexico, South Africa, Brazil.
  - ▶ Most areas are data scarce or data poor.
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# 4. Requirements

- ▶ Process understanding:
  - Lack of studies worldwide.
  - Interception loss.
  - Cloud forests in marine tropics (sensitive to global warming).
  - Veg.–Atmos & Atmos–Soil interfaces and effects on infiltration and runoff under changing land use (given very high rainfall intensities).
  - Vertical water balance – canopy evap, soil storage, GW storage, water use by trees and rooting depths.
  - Surface water – ground water interactions are important in semi–arid tropics.

# 5. Meeting requirements

- ▶ Landscape classification and identifying required thematic layers (DEM, landcover, etc.).
  - ▶ Monitoring of state variables.
    - Particularly sub-surface environment.
  - ▶ Estimating mean residence times and flow paths thro' environmental isotope tracing.
  - ▶ Limited gauging campaigns at start of wet season (need many resources).
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# 5. Meeting the requirements

- ▶ Protocol for catchment function diagnostics
  - Infiltration data linked to soil types.
  - Interception characteristics.
  - Sub-surface conditions.
  - Surface – GW interactions.
- ▶ Use of a decision tree as a preliminary stage to modelling.
  - Based on the protocol.



# 6. Answering the question

- ▶ Most of the data rich areas are very small headwater catchments.
  - ▶ Conceptual modelling approaches are applicable and appropriate:
    - Are we getting results for the right reason?
  - ▶ Many approaches difficult to implement reliably given available data and understanding.
  - ▶ Scale transfer problems:
    - Need a range of scales to achieve up-scaling effectively.
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