Application of HYMAN Model to evaluate water and salt budgets in Shark River Estuary

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Outline

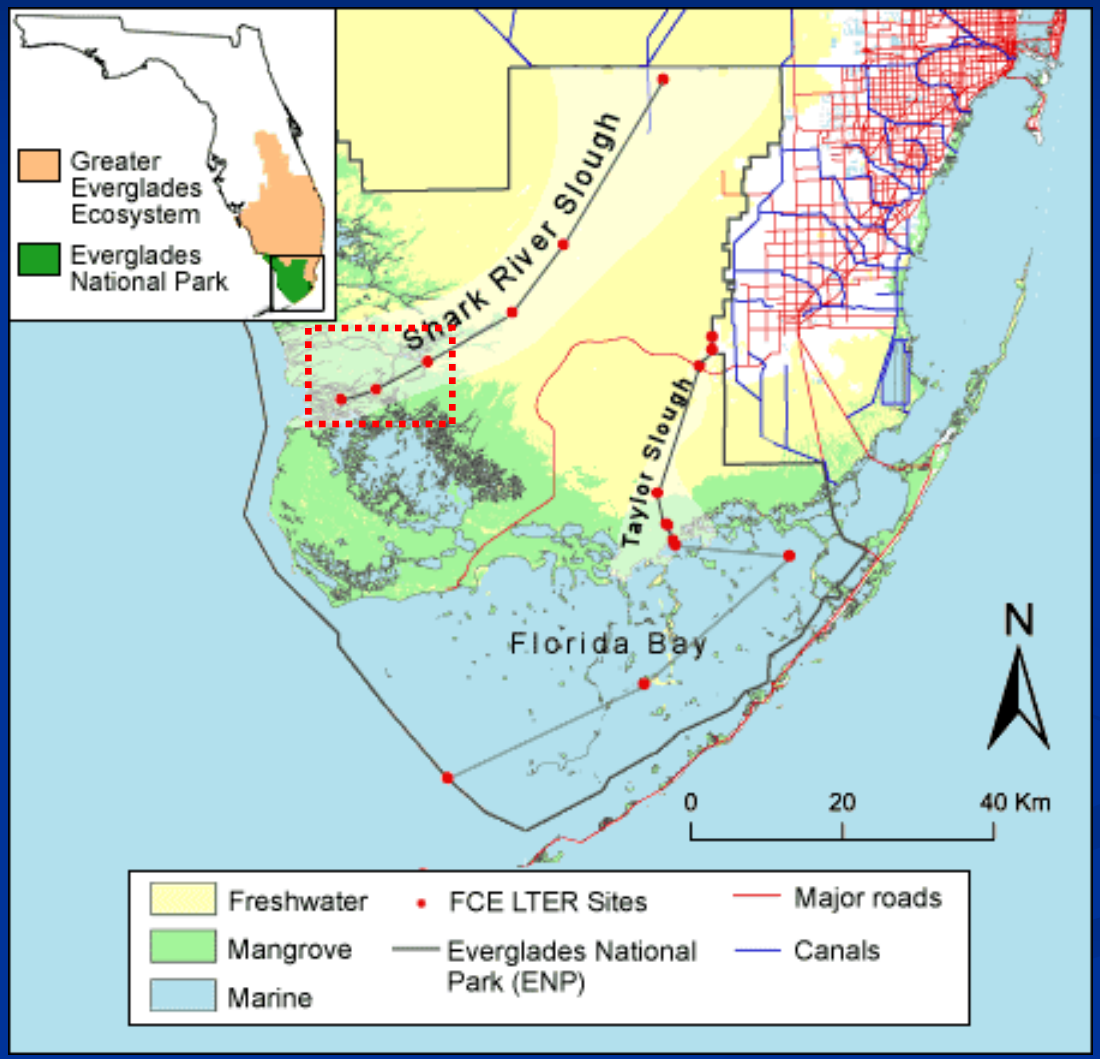
- Introduction
- Study Sites/Monitoring Stations
- Conceptual Model
- Input Parameters
- Data Analyses
- Results & Discussions
- Conclusions

1. The Importance of Coastal Wetlands

- Reduce storm surge and saltwater intrusion
- Support food chain
- Provide wildlife habitats
- Improve water quality
- Maintain a near-sea-level elevation
- Protect coastal community

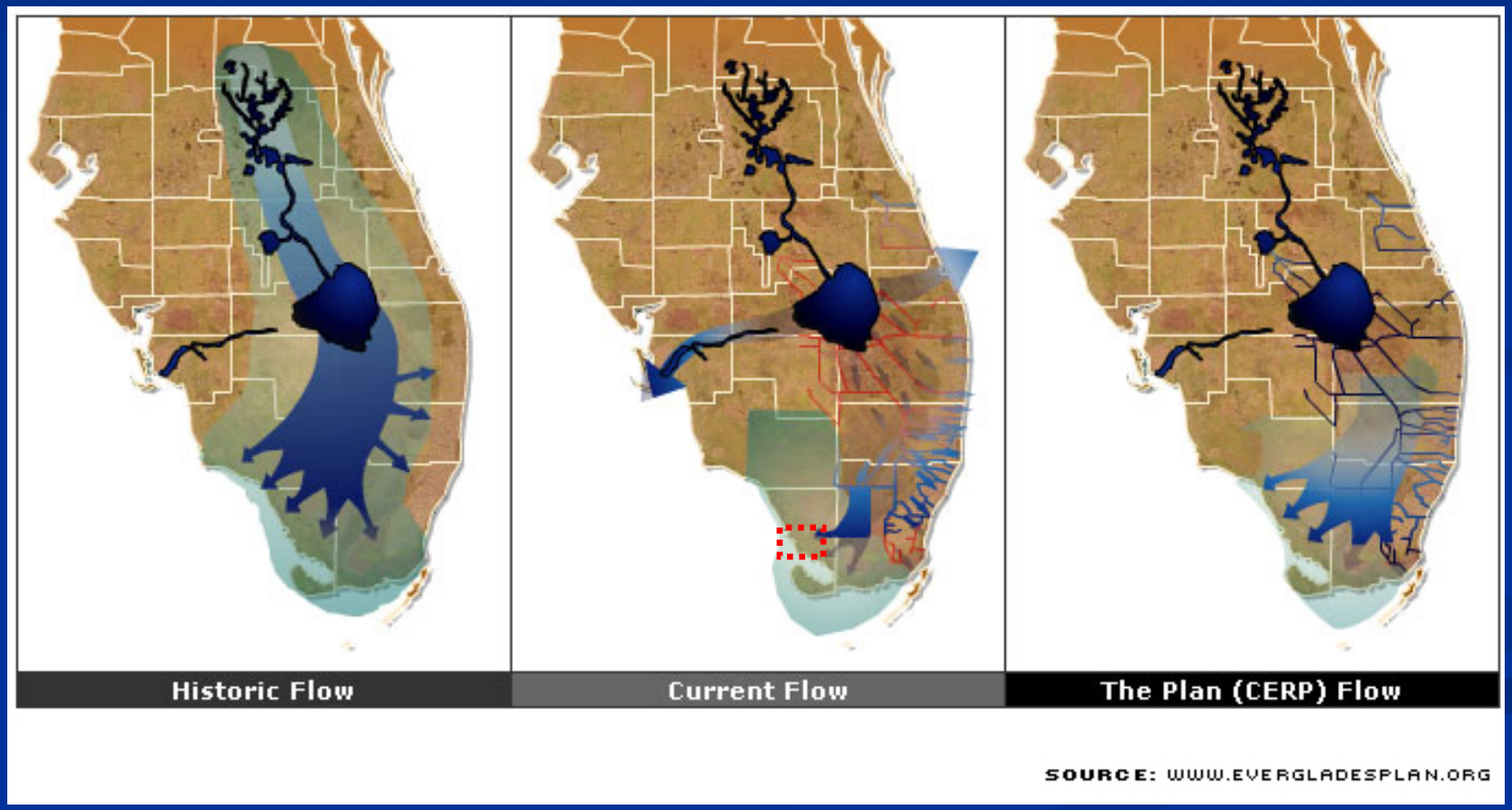
(Patrick 1994; Day *et al.* 1995; Kadlec 1995; Nepf 1999; Mitsch and Gosselink 2000; Day *et al.* 2007; Melesse *et al.* 2007; Spalding and Hester 2007)

2. The Everglades



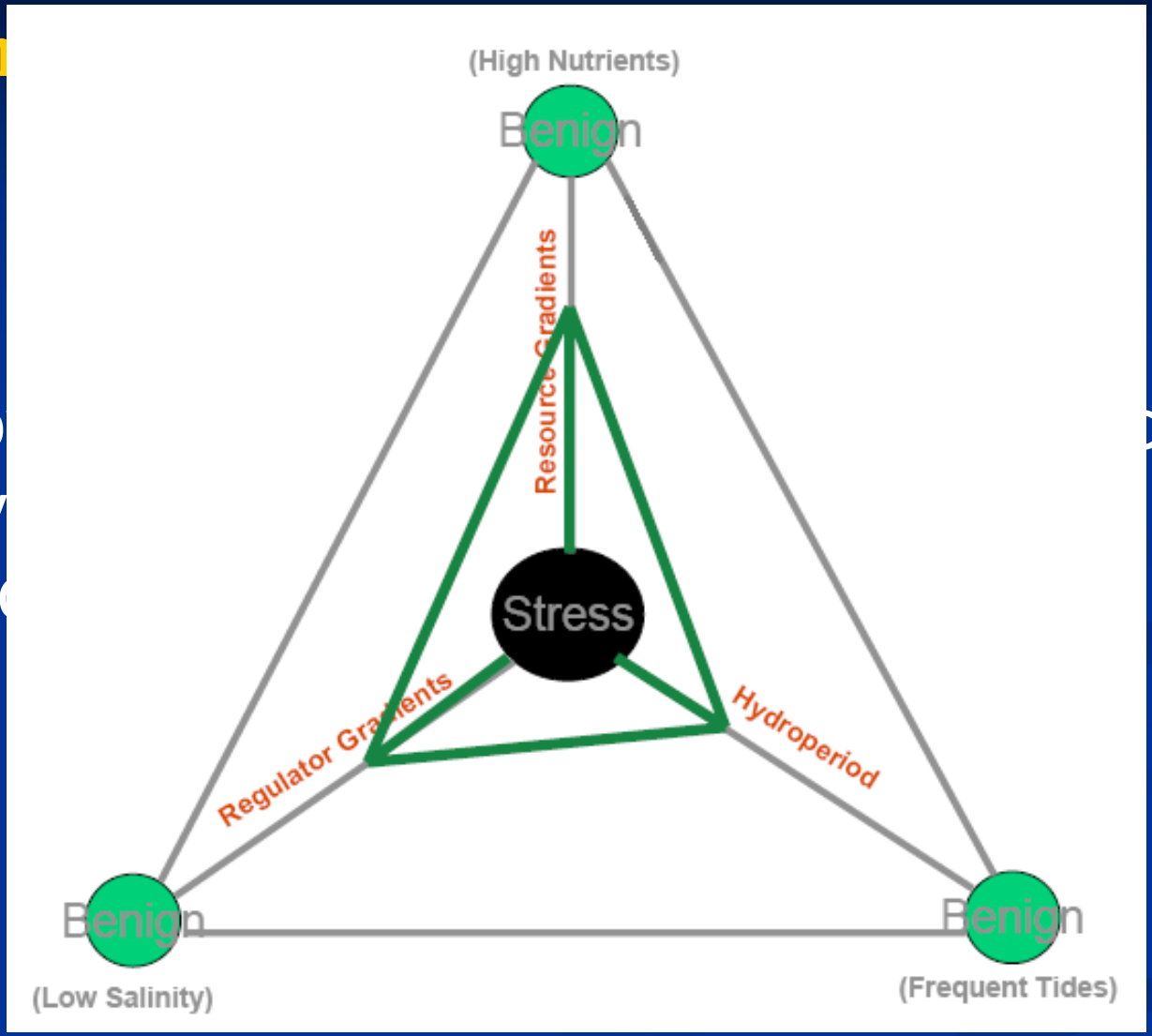
Source: http://fcelter.fiu.edu/

3. The Water Flow in the Everglades



4. Cen

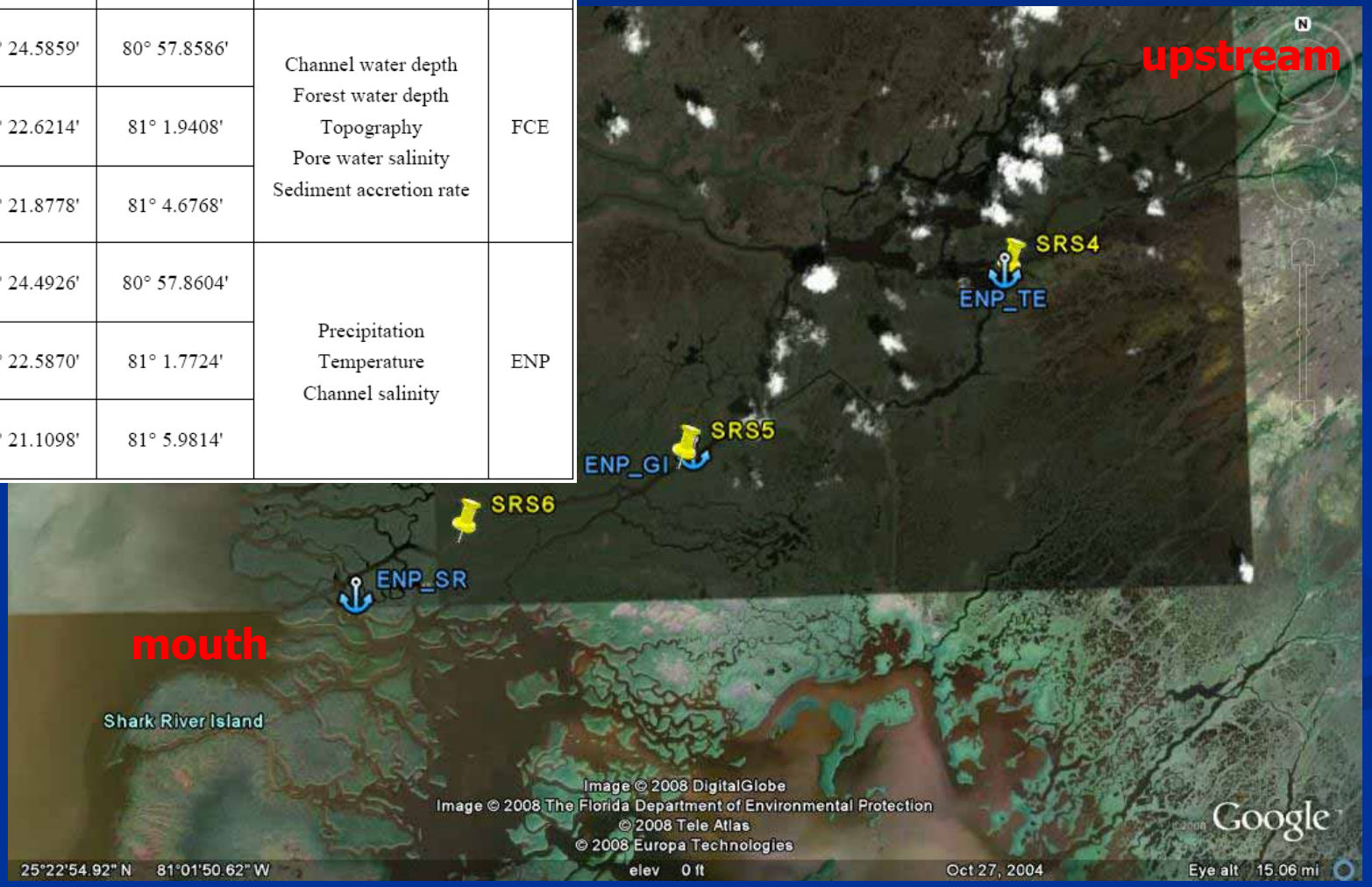
Ho cape
lev
buc



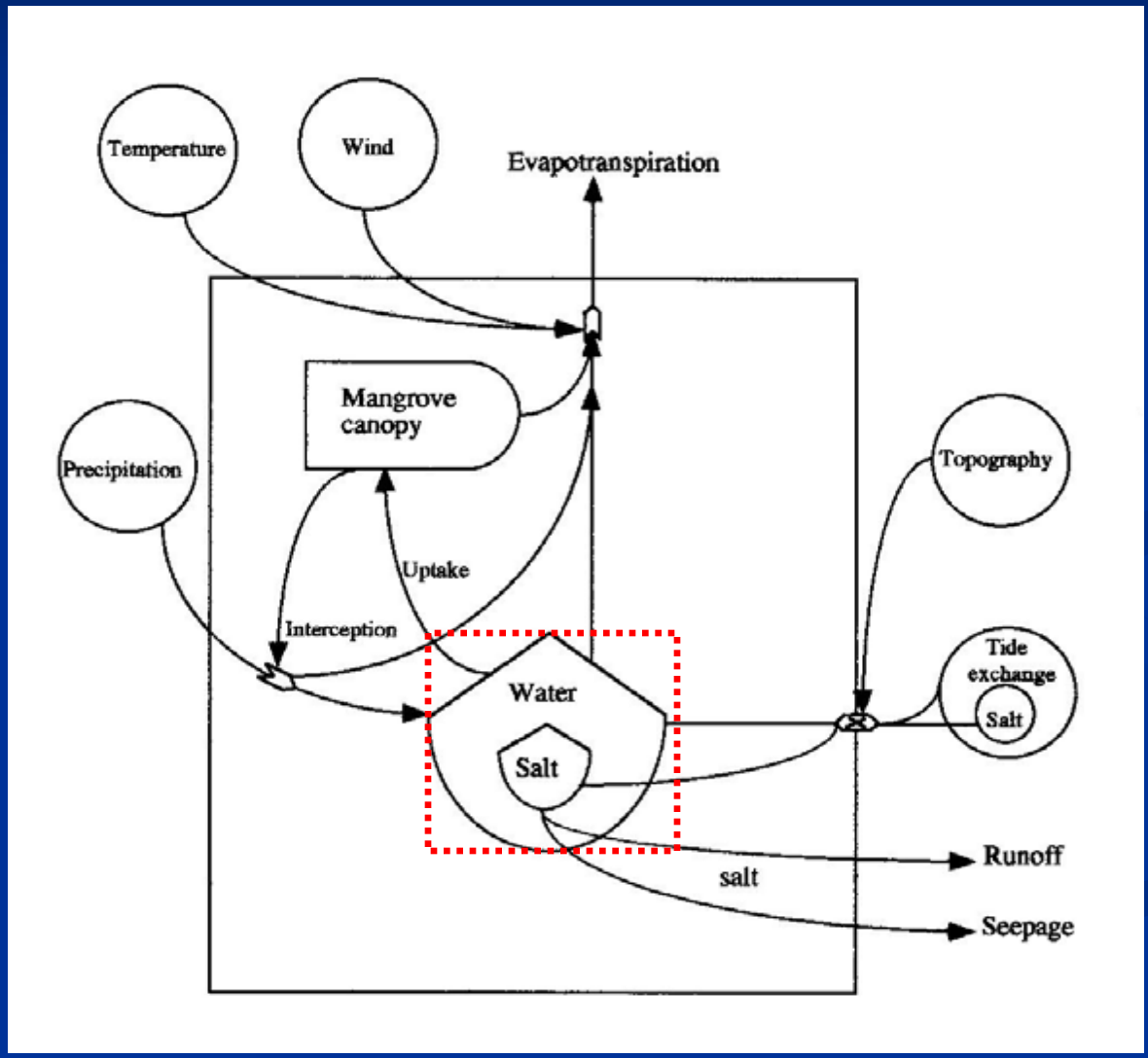
(Twilley and Rivera-Monroy 2005)

5. Study Sites and Monitoring Stations

Site	Latitude (N)	Longitude (W)	Availability	Agency
SRS4	25° 24.5859'	80° 57.8586'	Channel water depth Forest water depth Topography Pore water salinity Sediment accretion rate	FCE
SRS5	25° 22.6214'	81° 1.9408'		
SRS6	25° 21.8778'	81° 4.6768'		
ENP_TE	25° 24.4926'	80° 57.8604'	Precipitation Temperature Channel salinity	ENP
ENP_GI	25° 22.5870'	81° 1.7724'		
ENP_SR	25° 21.1098'	81° 5.9814'		



6. Conceptual Model of HYMAN

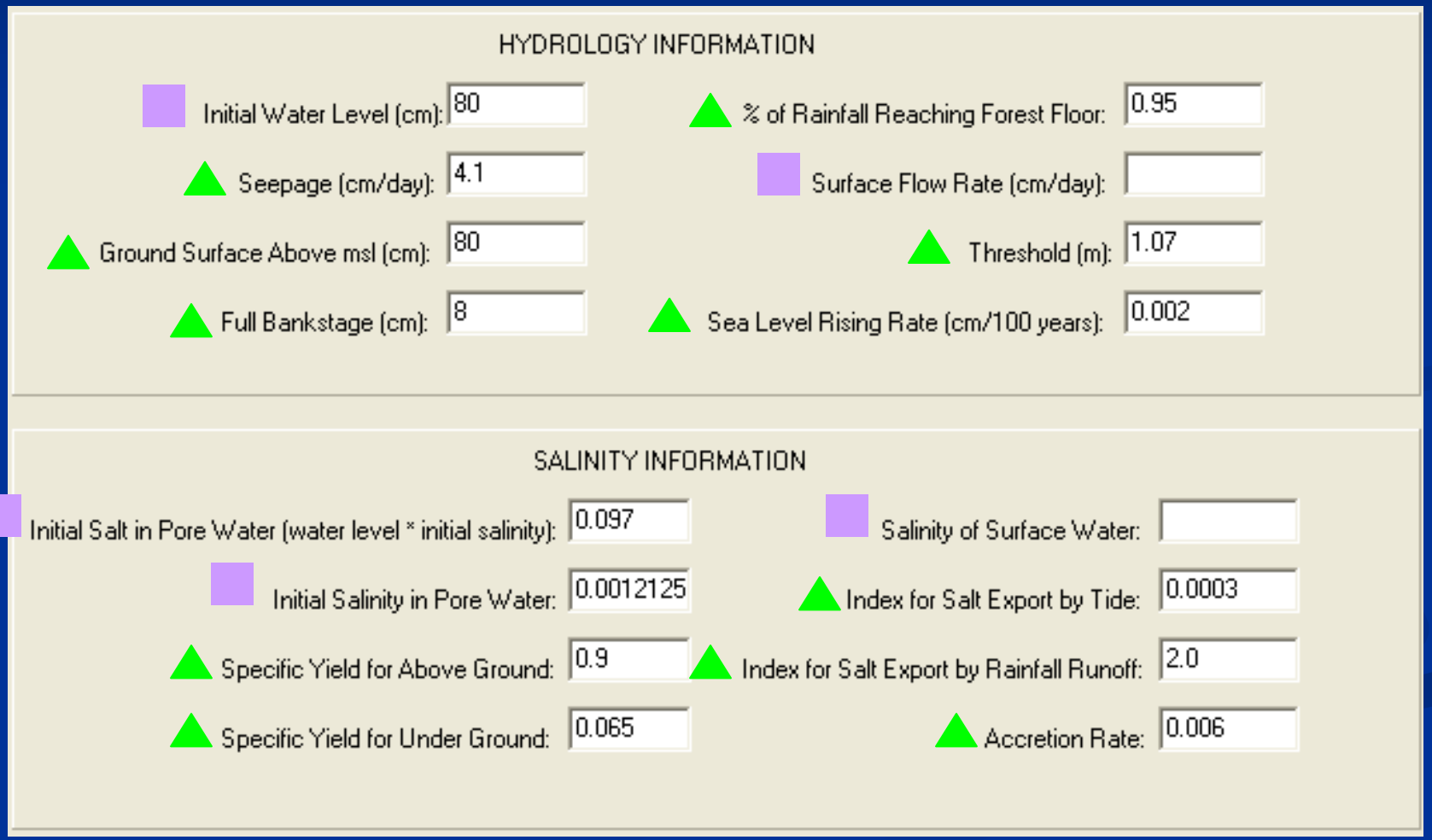


(Twilley 1982)

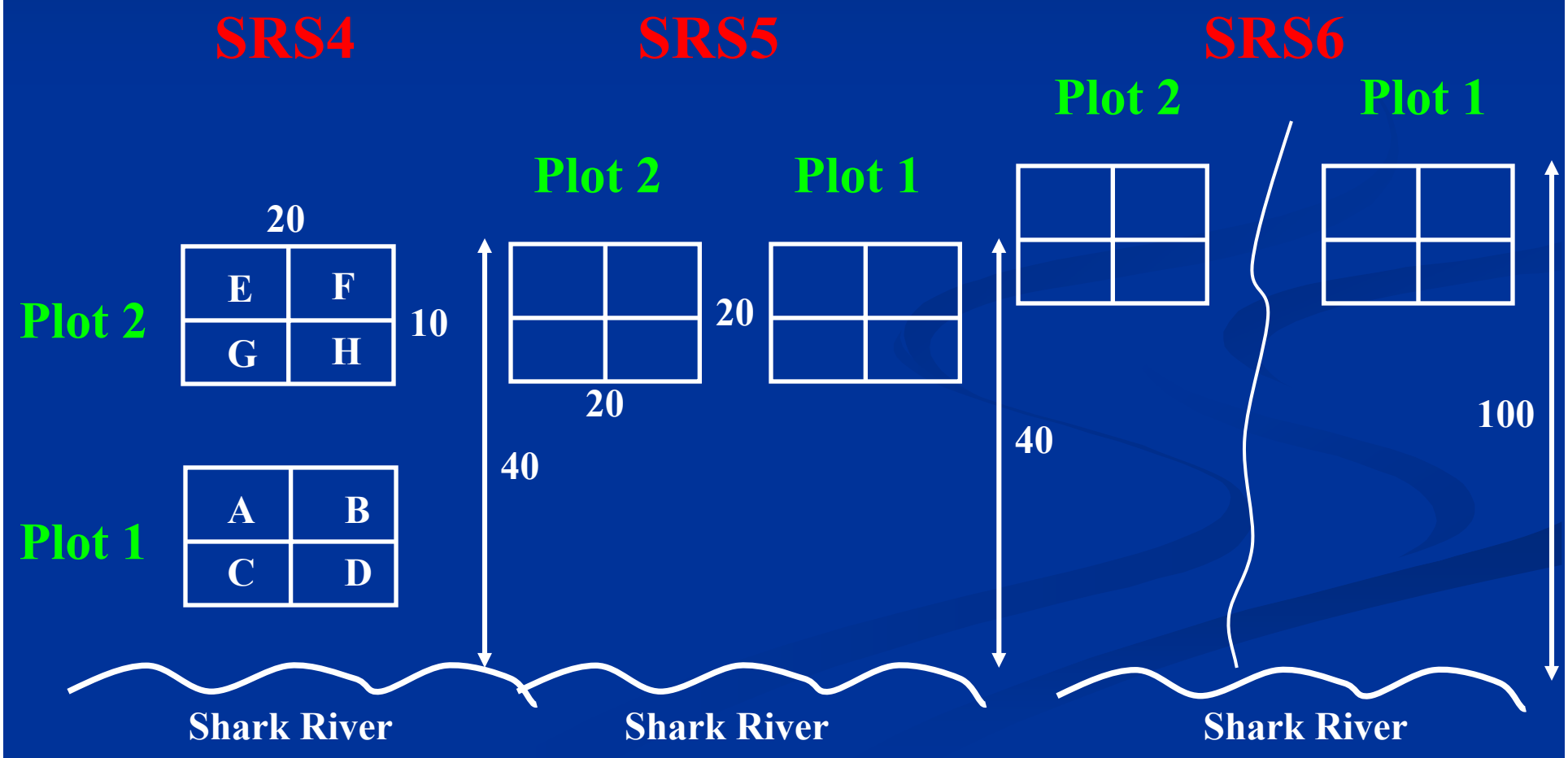
7. Input Parameters

▲ : constants

■ : daily variables

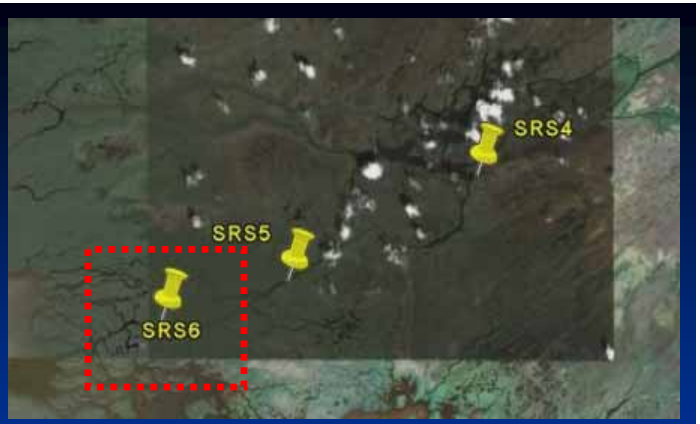


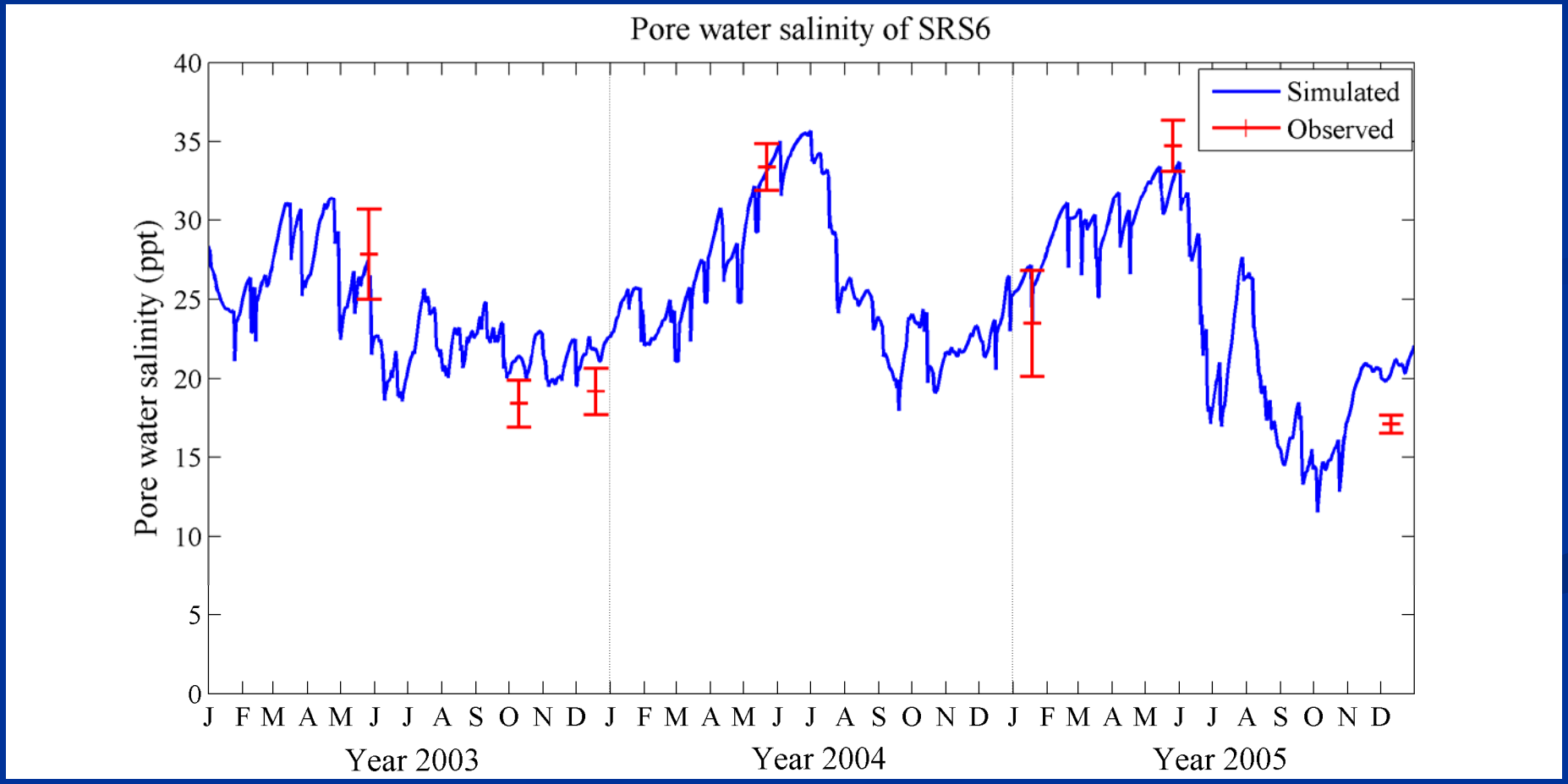
8. Pore water measurements



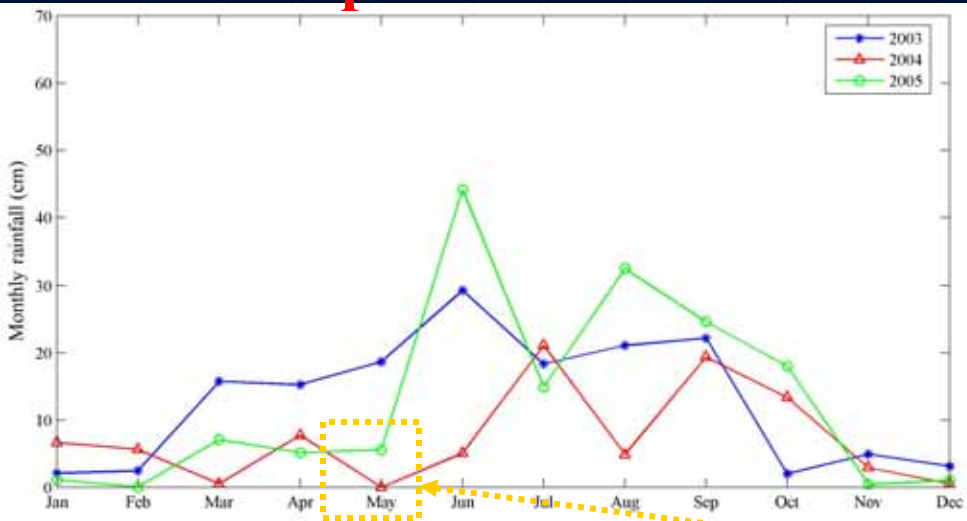
9. Results and Discussions

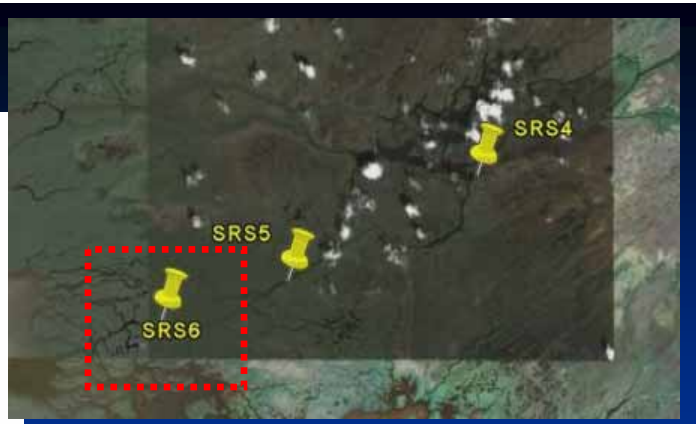
SRS6

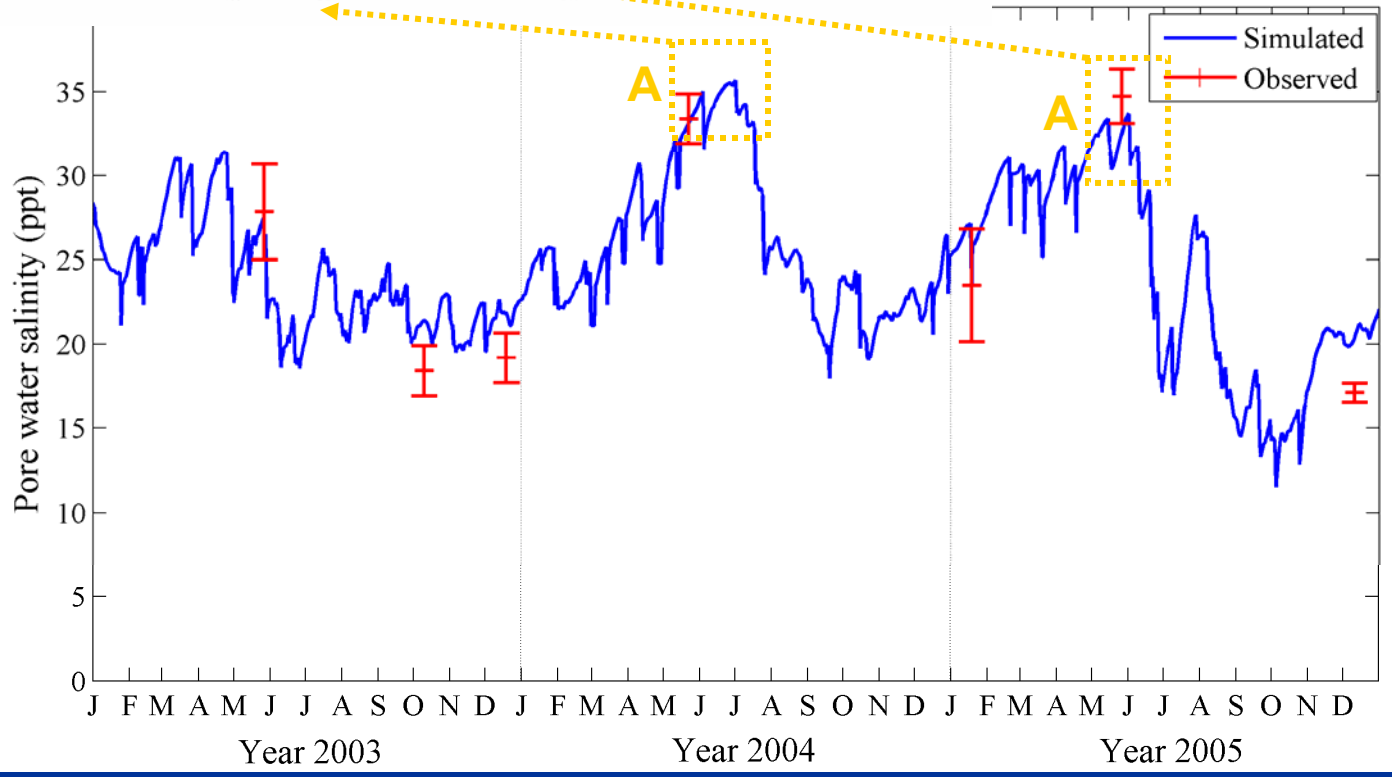

SRS4
SRS5
SRS6


Pore water salinity of SRS6
Pore water salinity (ppt)
0
5
10
15
20
25
30
35
40
Simulated
Observed
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Year 2003
Year 2004
Year 2005

Precipitation in SRS6

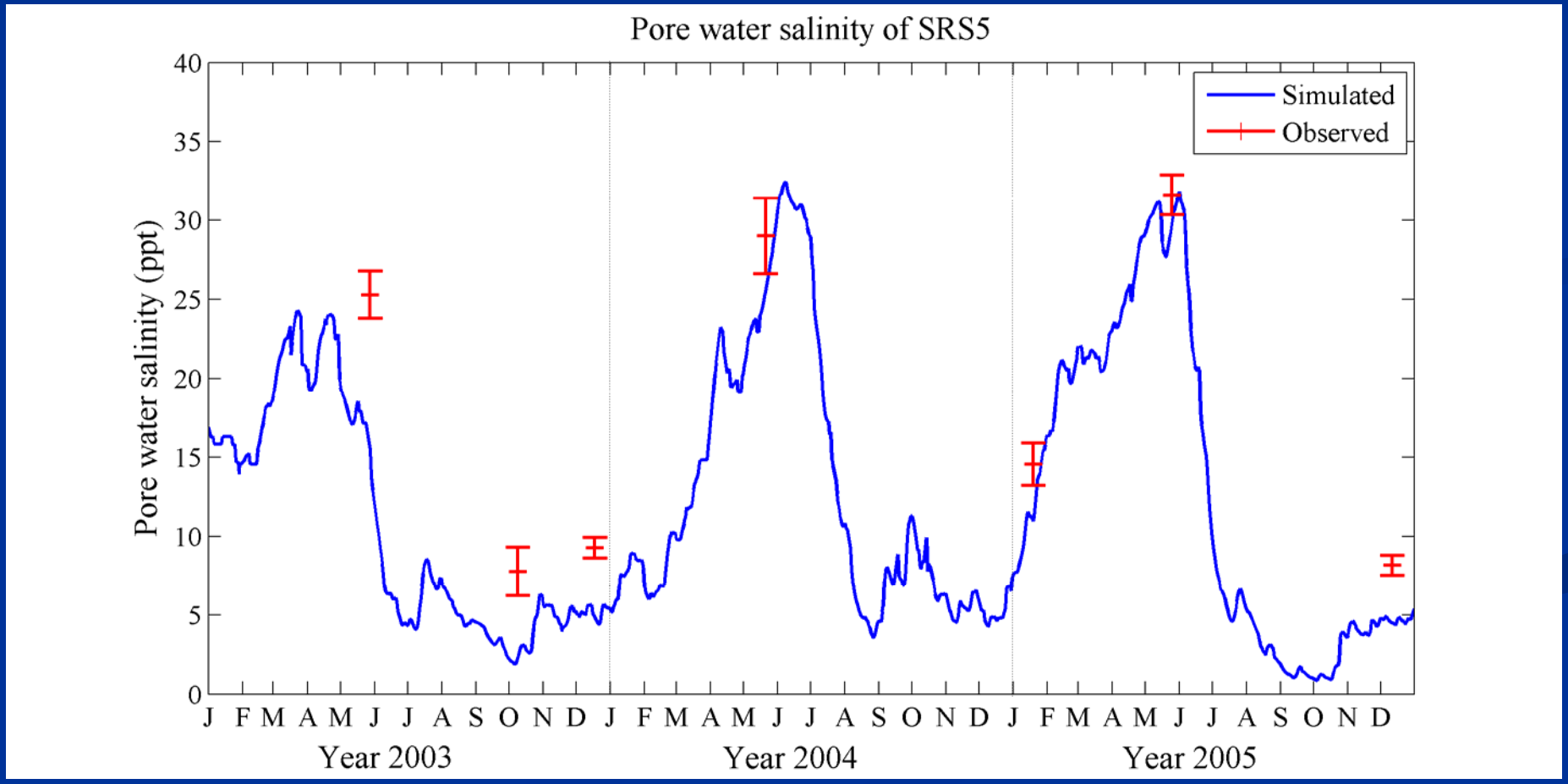




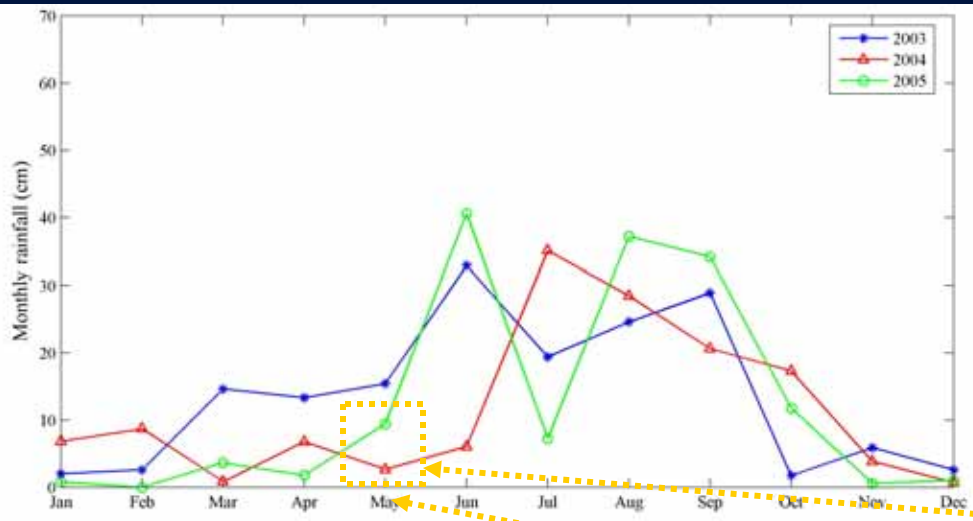


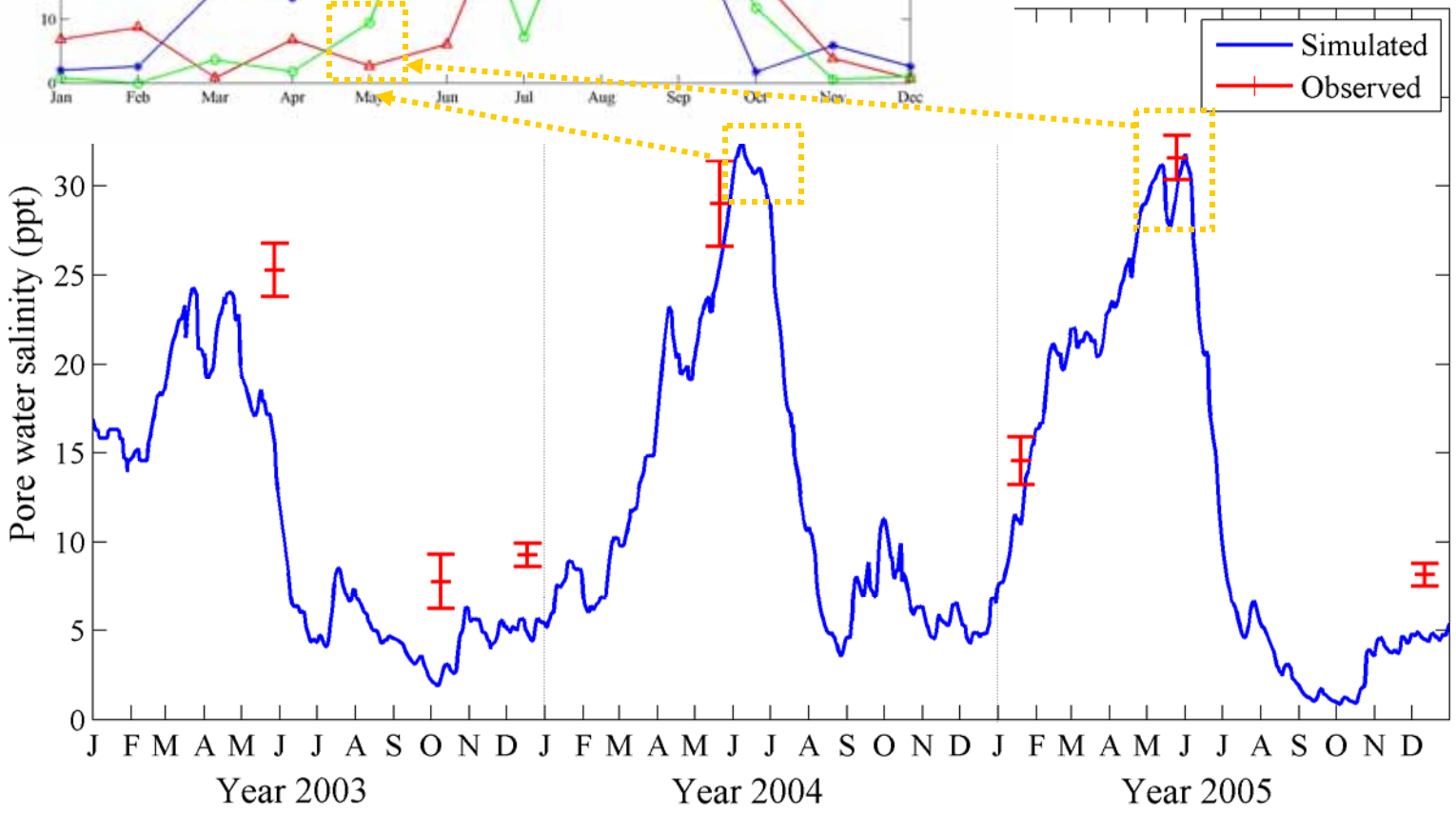
SRS5


SRS4
SRS5
SRS6

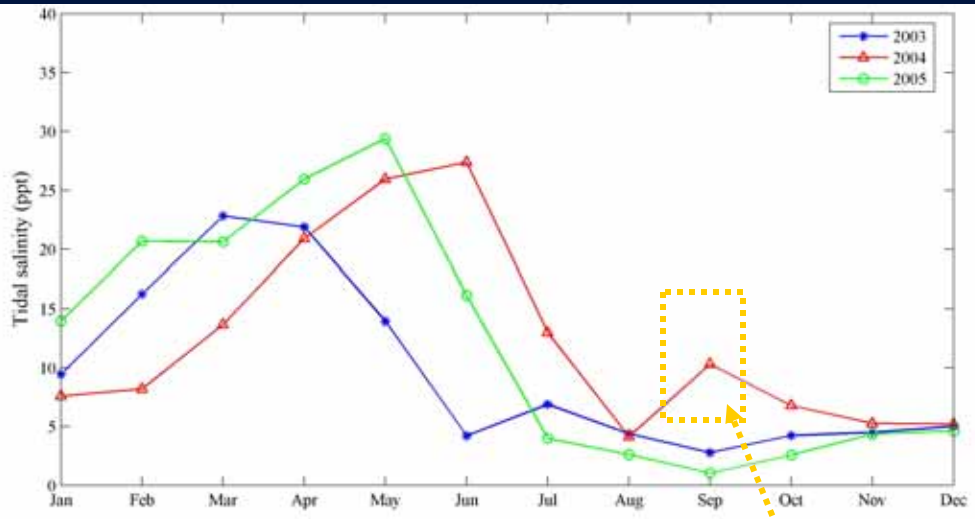

Pore water salinity of SRS5
Pore water salinity (ppt)
0
5
10
15
20
25
30
35
40
Simulated
Observed
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Year 2003
Year 2004
Year 2005

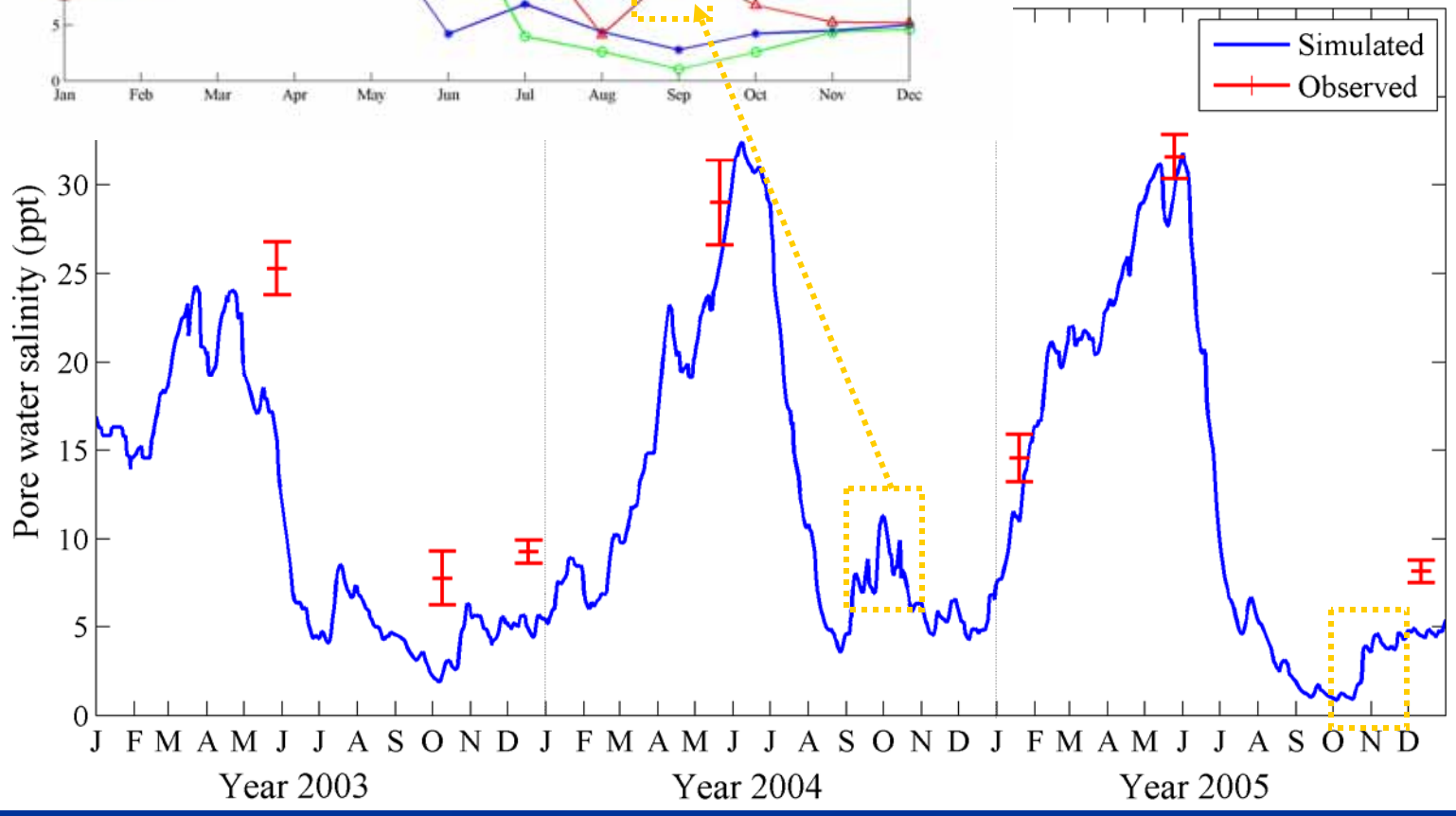
Precipitation in SRS5





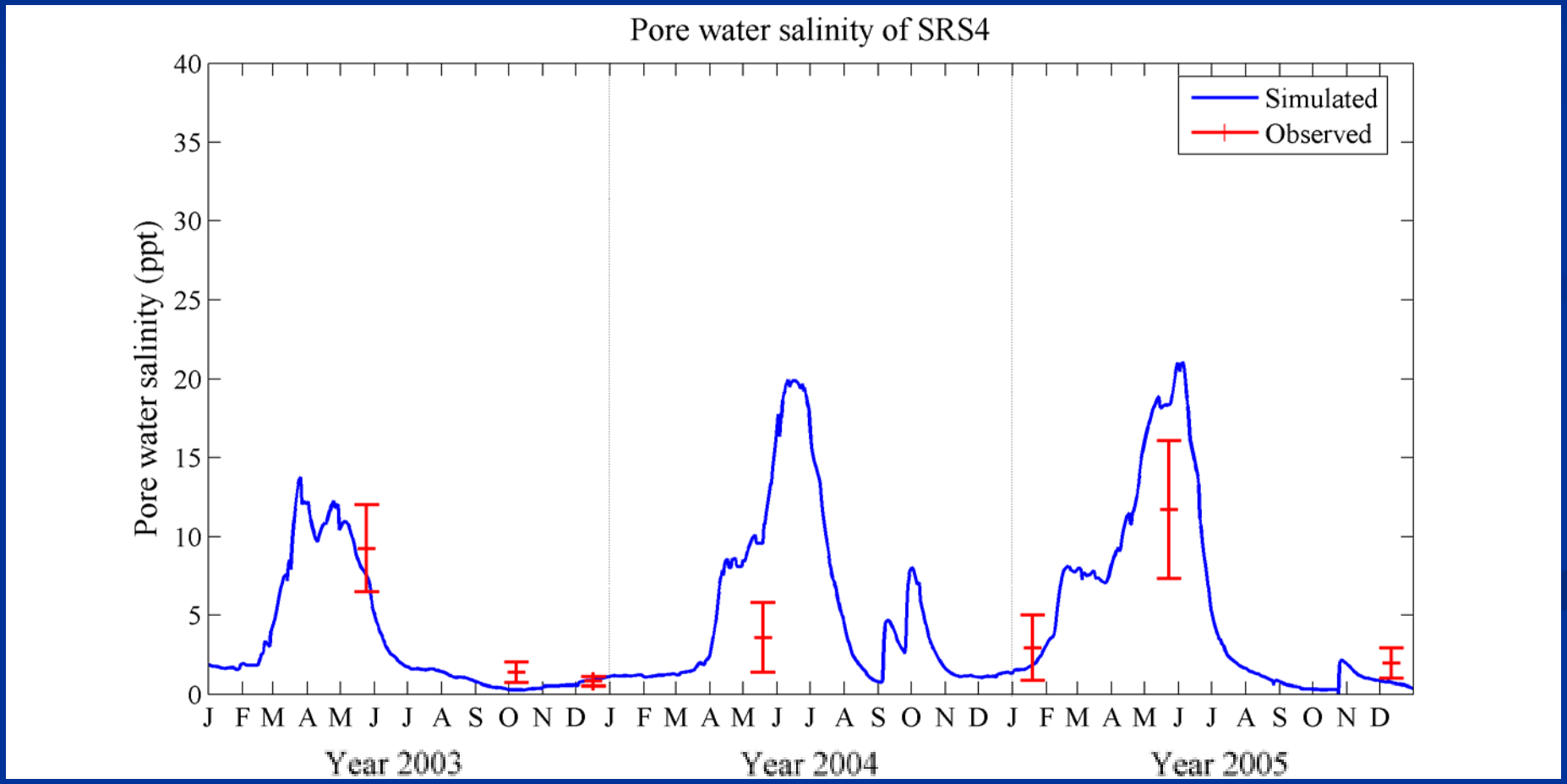
Tidal salinity in SRS5



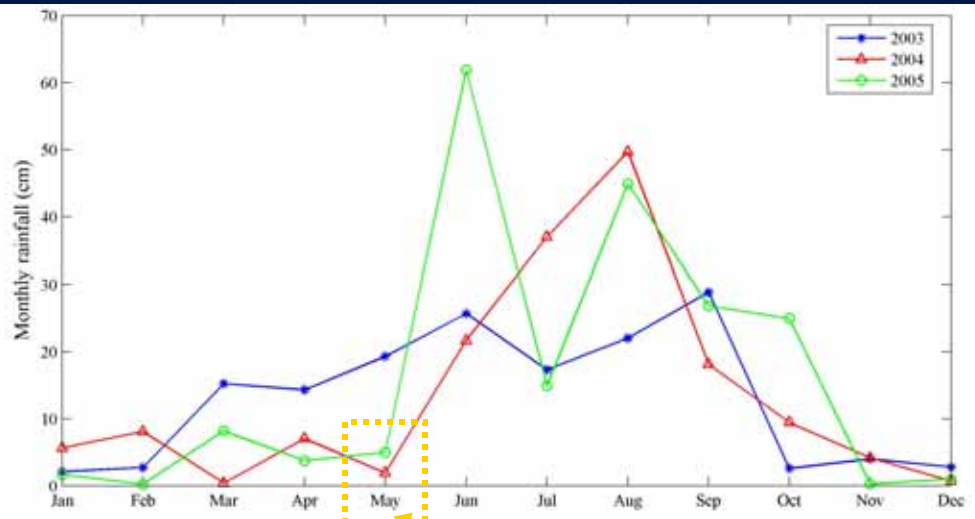


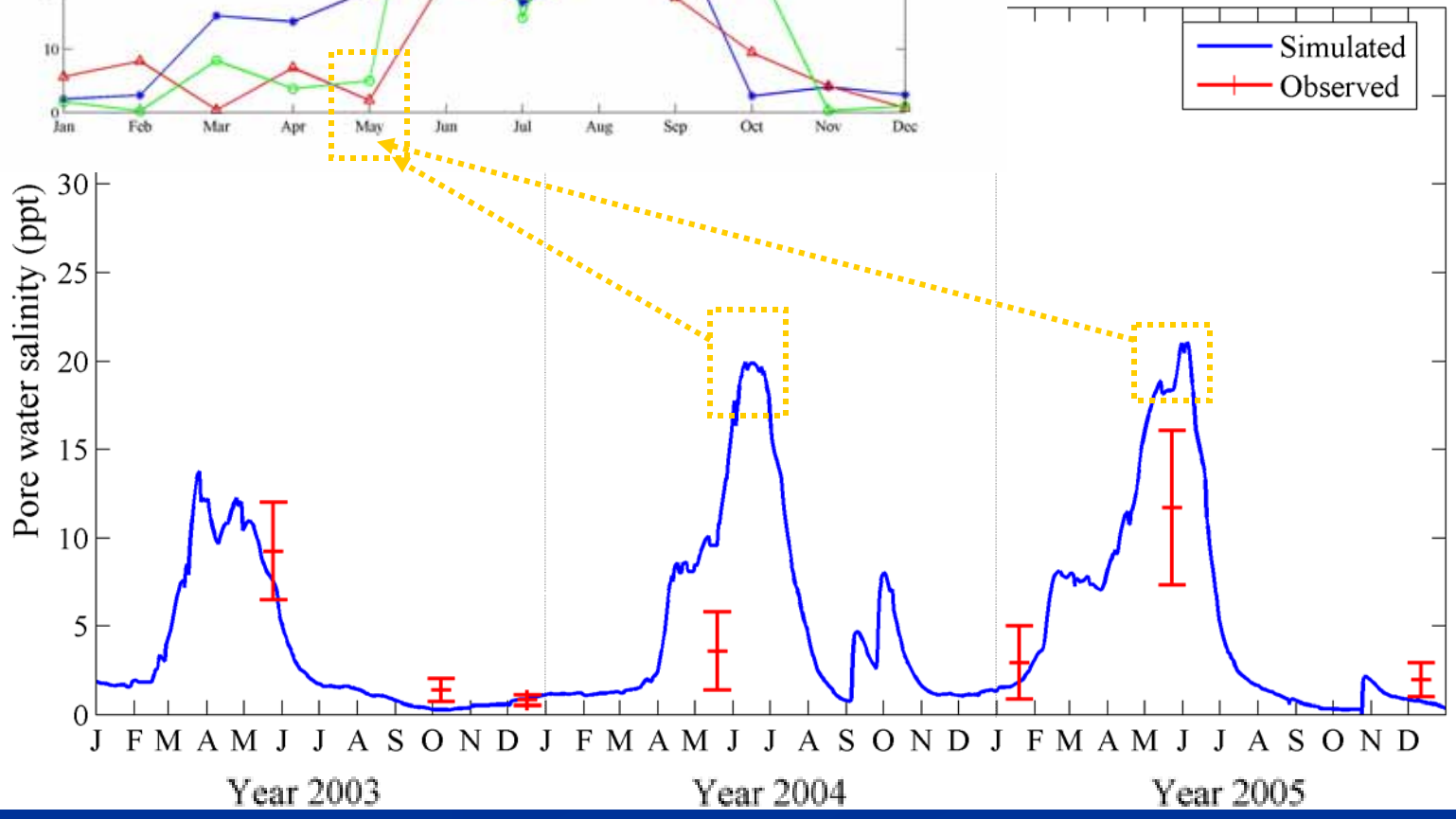
SRS4


SRS4
SRS5
SRS6

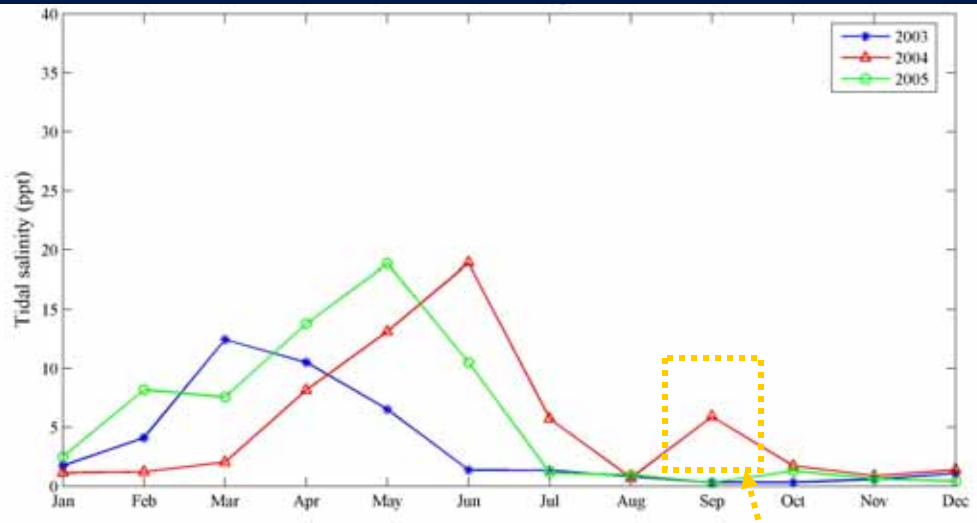

Pore water salinity of SRS4
Pore water salinity (ppt)
Simulated
Observed
0
5
10
15
20
25
30
35
40
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Year 2003
Year 2004
Year 2005

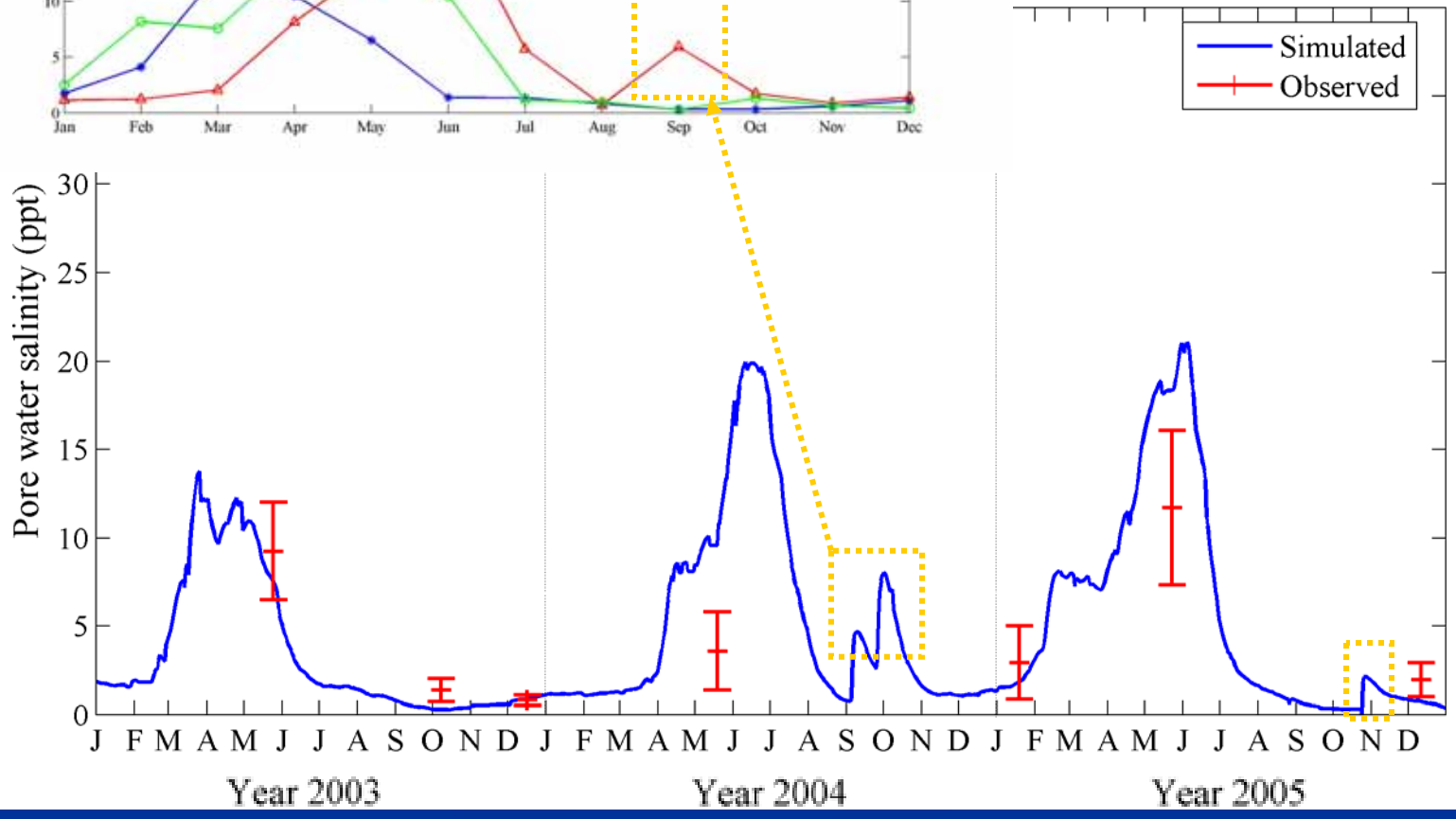
Precipitation in SRS4





Tidal salinity in SRS4





10. Conclusions

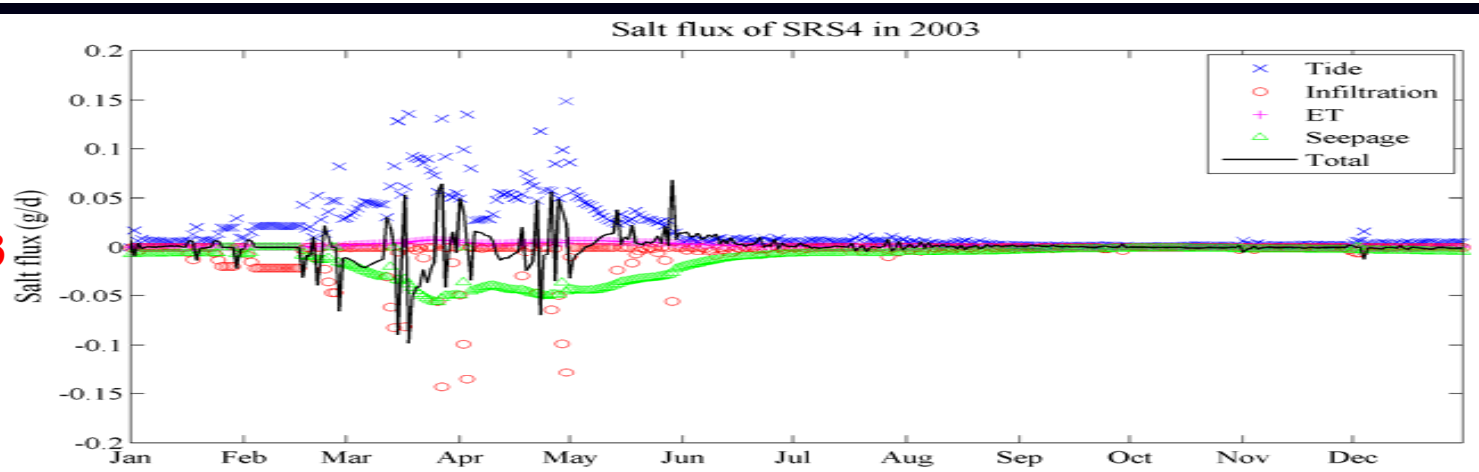
- The modified HYMAN model can reasonably match the pore water salinity observation trends in these three mangrove forest sites
- The simulated pore water salinity at each site is consistent with its distance to the estuary mouth
- Topography (e.g. bankstage) is the most critical factor to calibrate the HYMAN model
- Precipitation determines the timing of the pore water salinity peak in the forest

11. Future Study

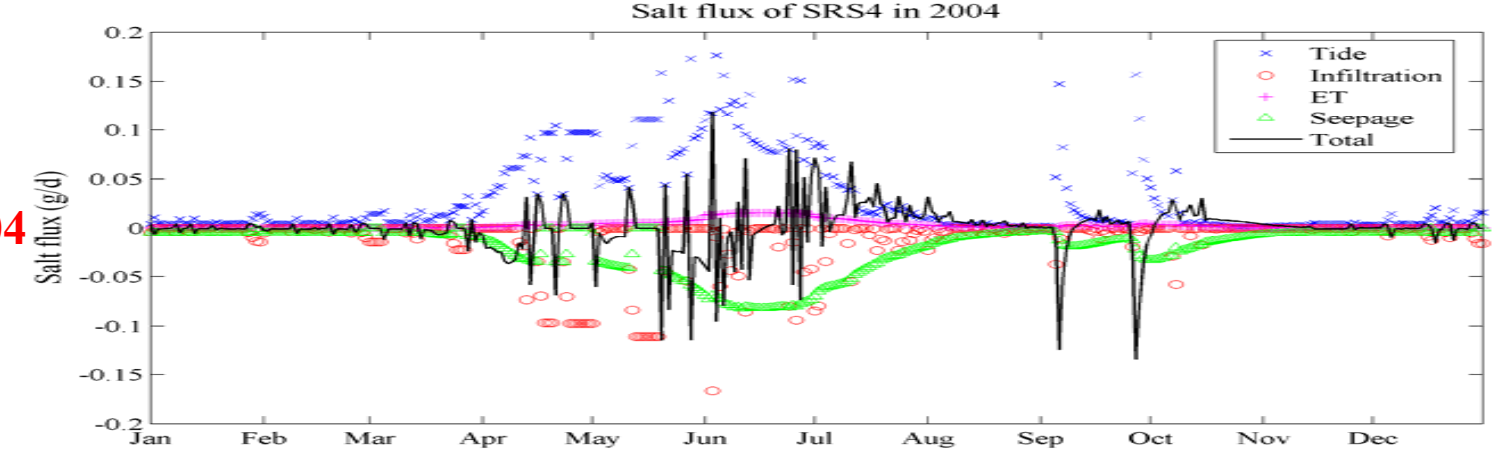
- Measure actual surface runoff
- Determine groundwater recharge/discharge influence
- Test upstream freshwater schemes
- Run global climate change/sea level rise impacts

Questions?

2003



2004



2005