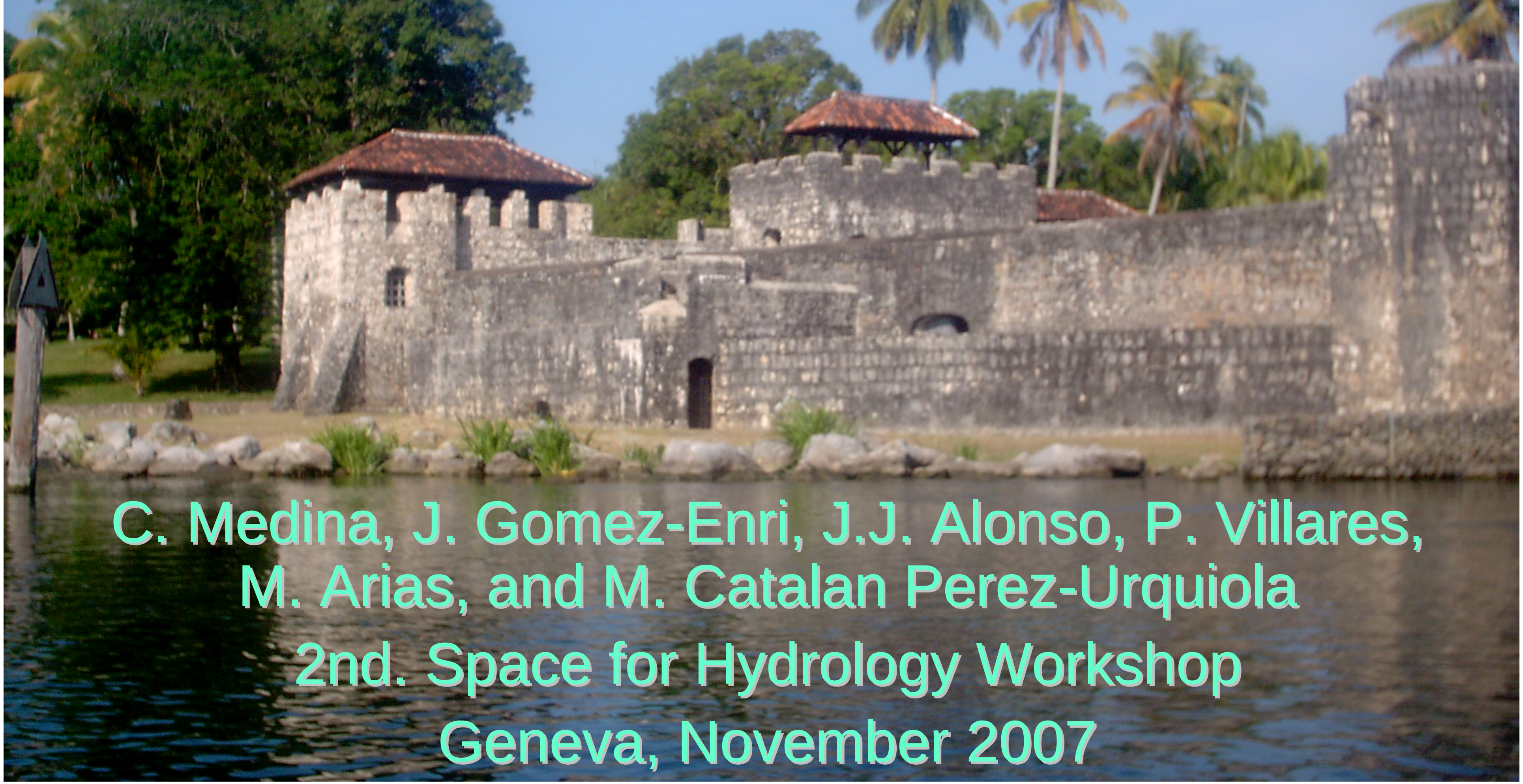
Lake Izabal water level fluctuations from ENVISAT RA-2. Relationships with water inputs from a numerical runoff model



C. Medina, J. Gomez-Enri, J.J. Alonso, P. Villares, M. Arias, and M. Catalan Perez-Urquiola

2nd. Space for Hydrology Workshop

Geneva, November 2007

Contents

- Lake Izabal settings
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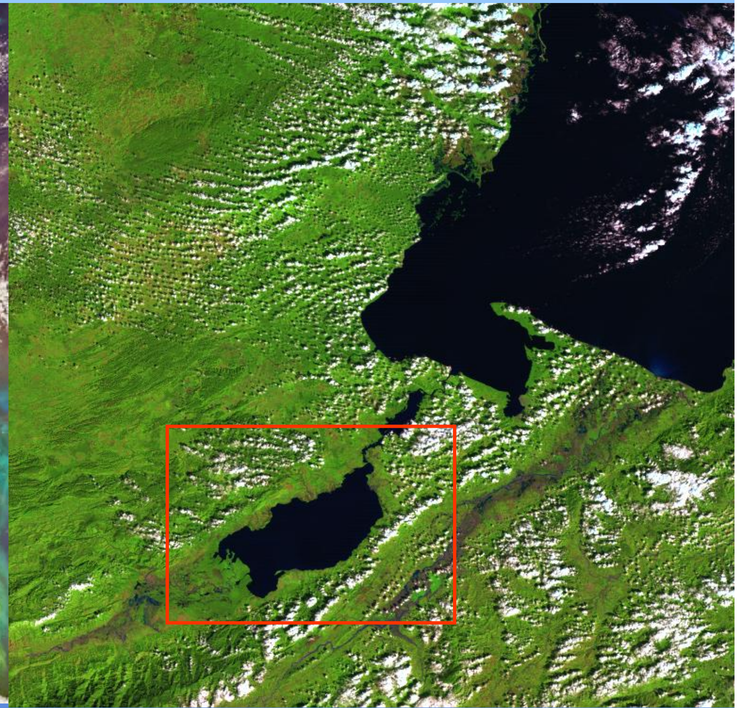
- Radar data processing
- Comparison with in-situ measurements
- Seasonal variability
- Hydrologic discharge model
- Relationships discharge vrs. Level
- Conclusions and work to do

Lake Izabal settings

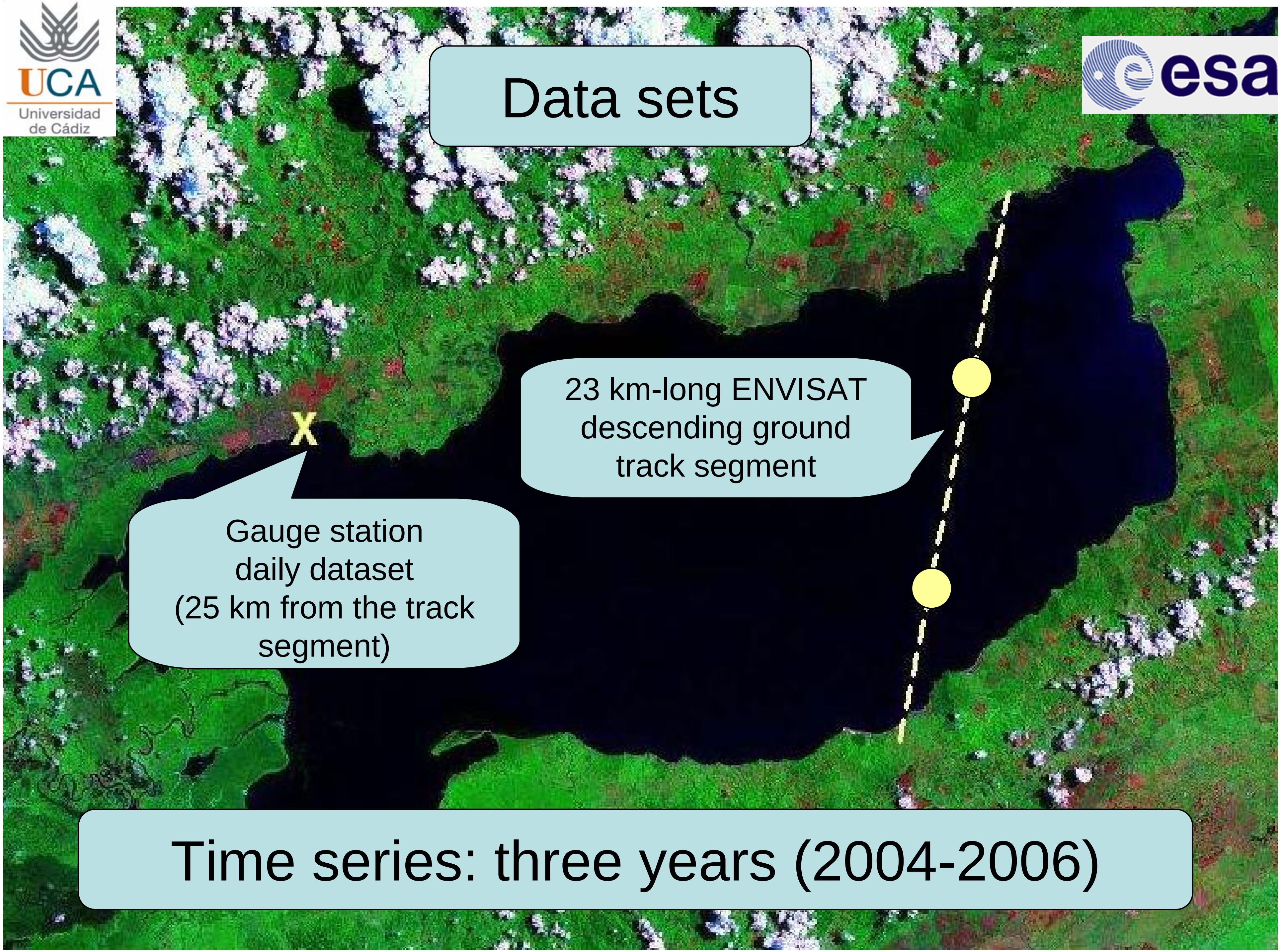




Guatemala, Central America
Caribbean coastal zone

Lake surface: 679 Km^2
Mean depth: 12 m

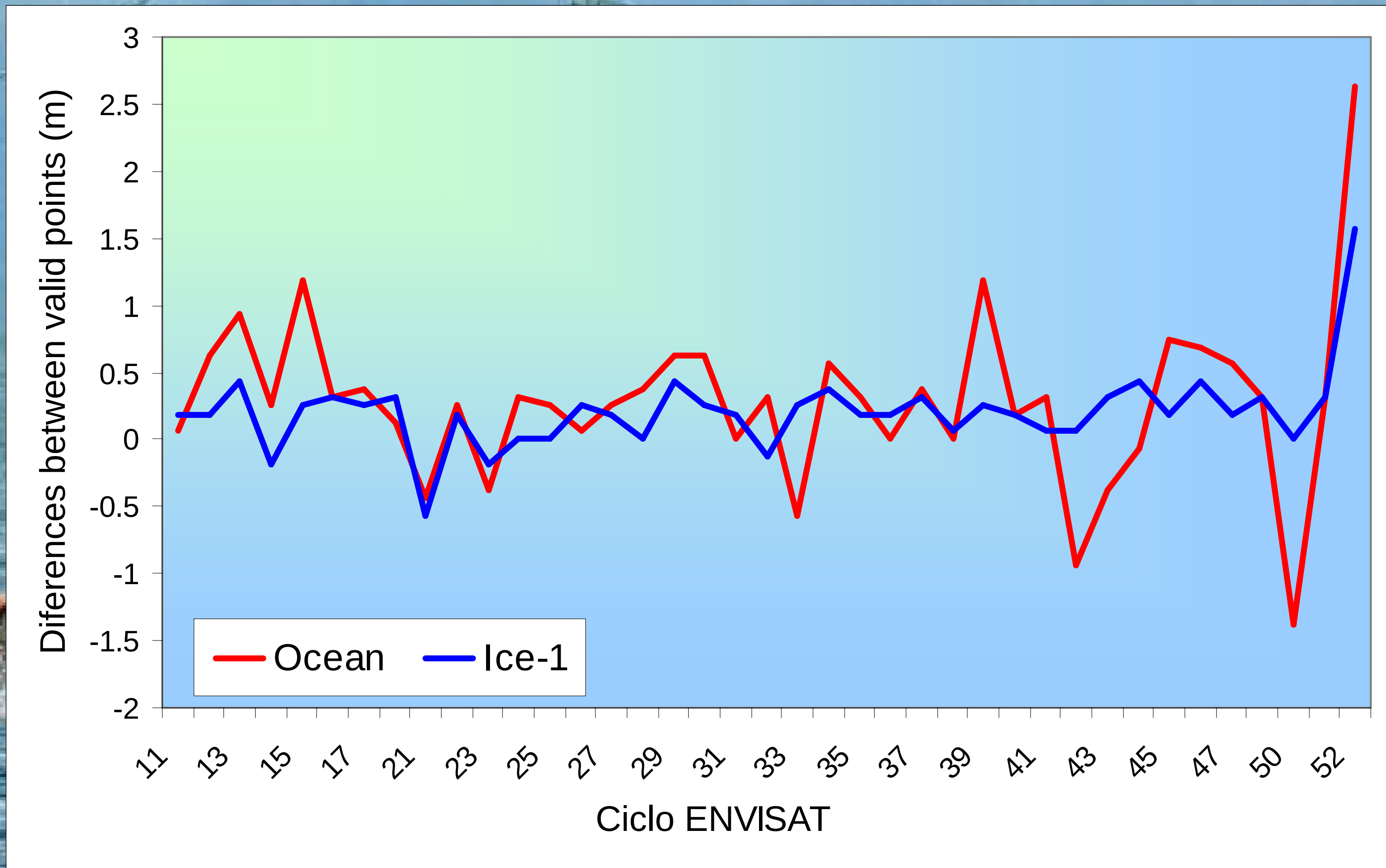
Data sets



Time series: three years (2004-2006)

Processing

Range → Ocean, Ice-1, Ice-2, Sea Ice

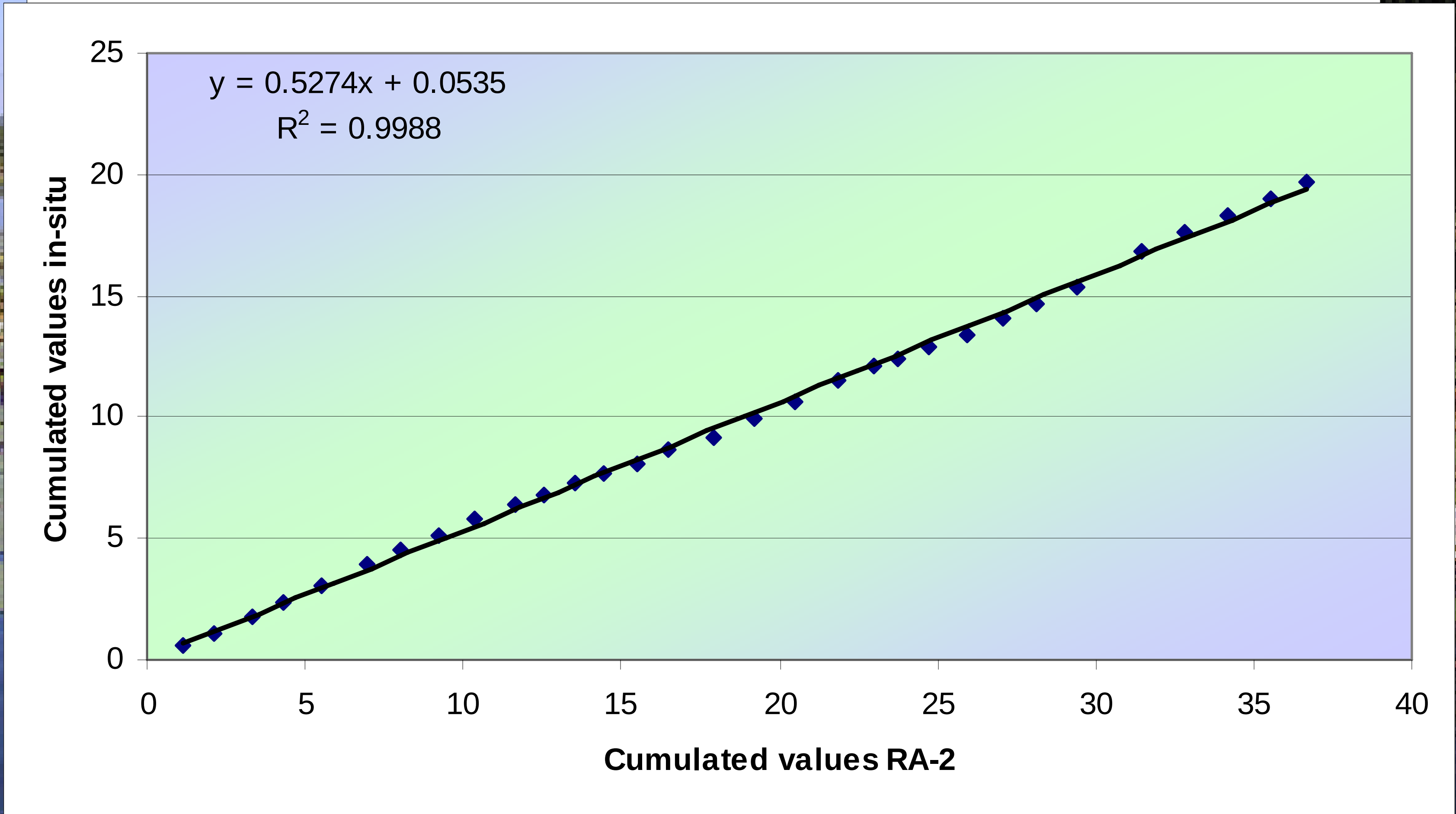


Retracking algorithm: Ice-1

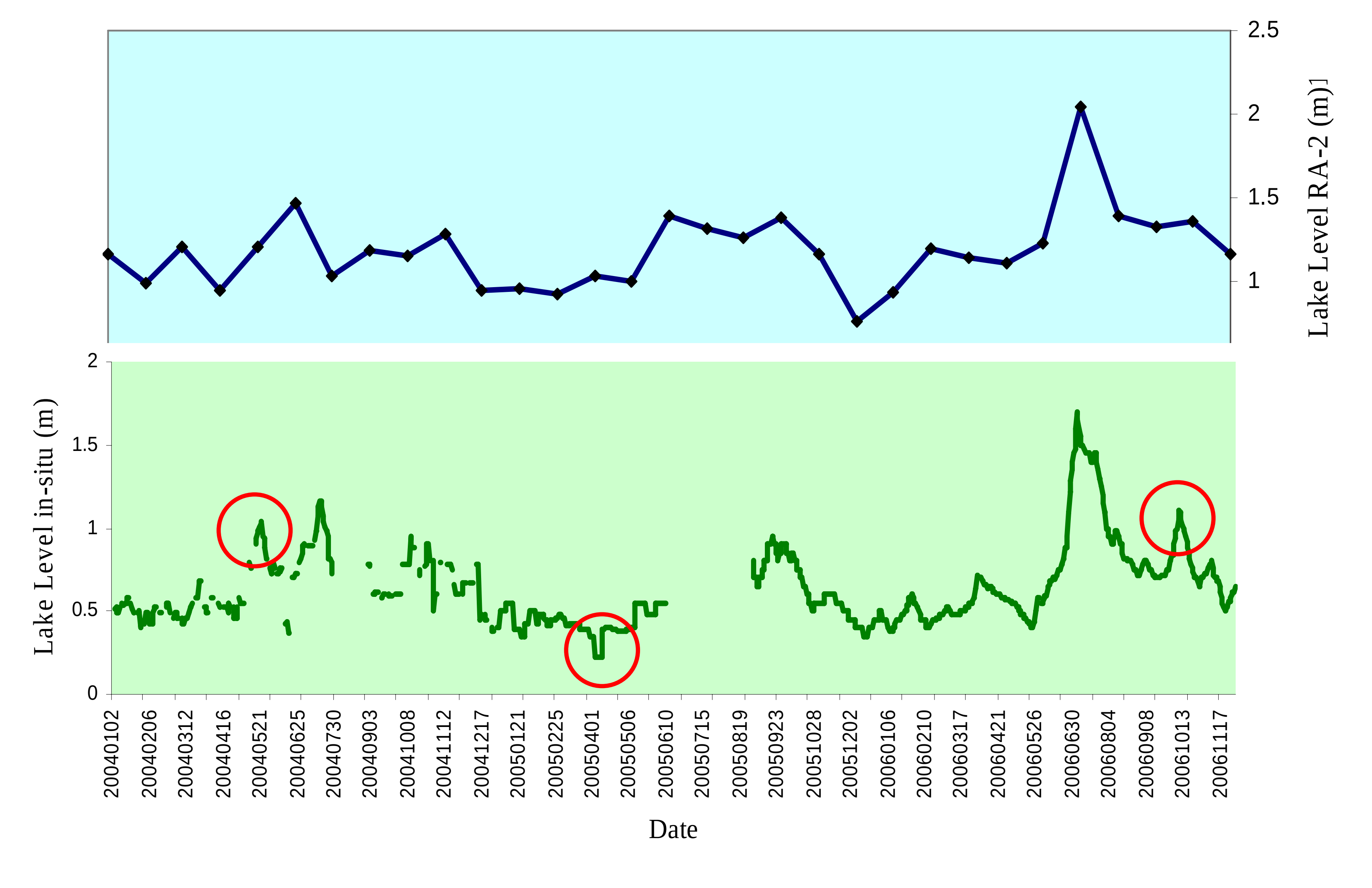
Geophysical corrections

- Dry troposphere (Model)
- Wet troposphere (Model)
- Ionospheric correction (DORIS)
- Solid earth tide (Model)
- Pole tide (Model)

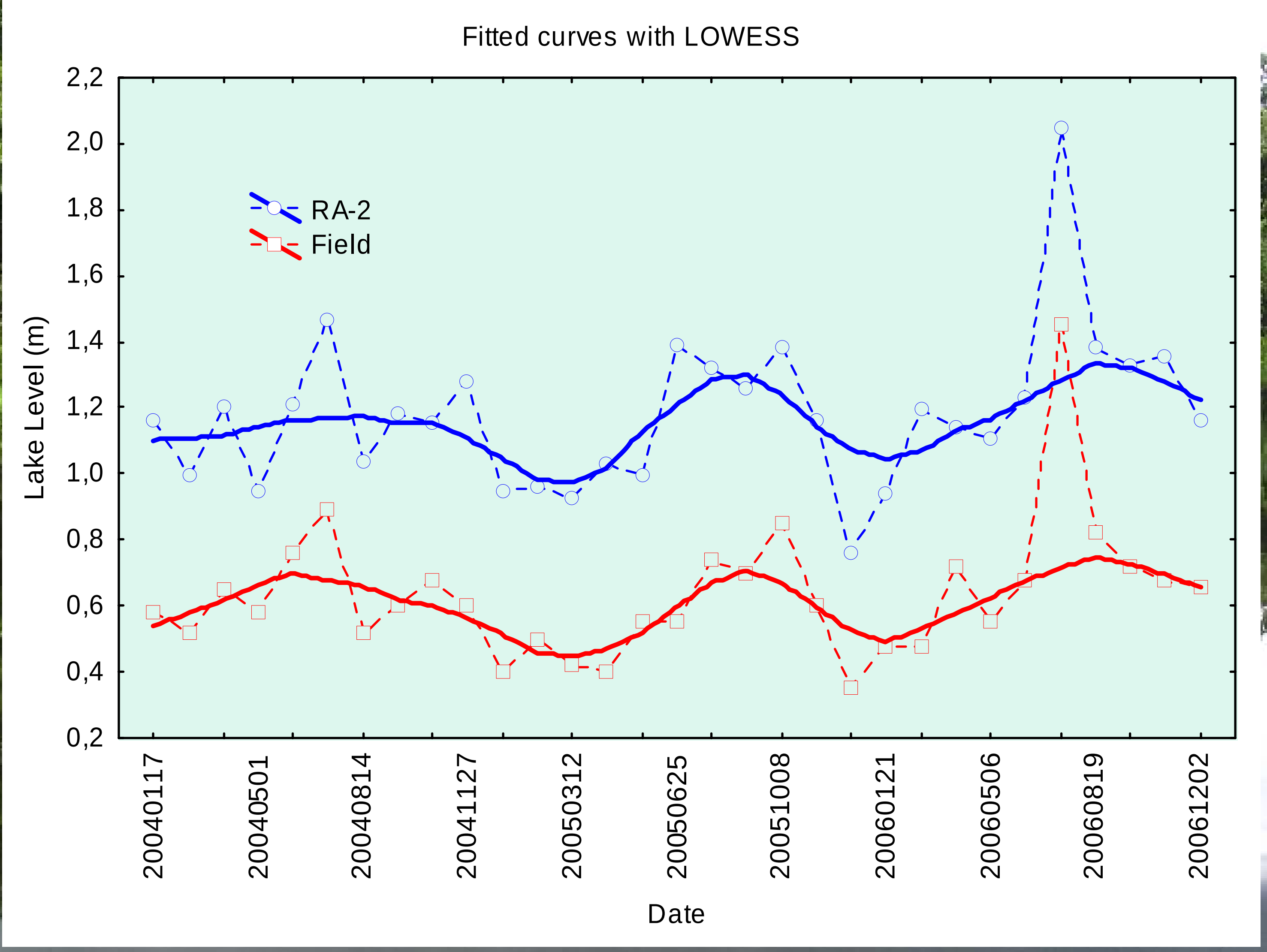
Comparison with in-situ Measurements



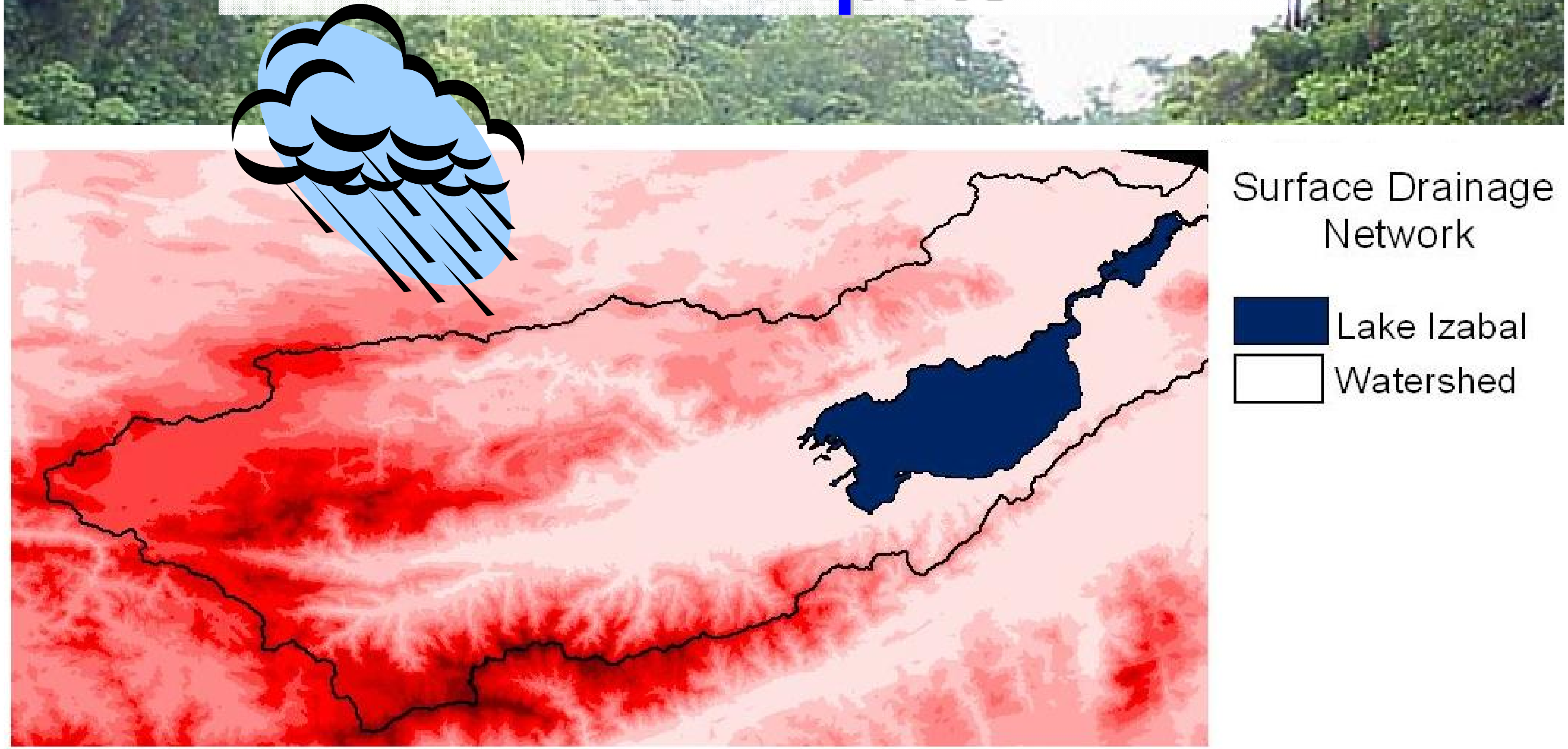
RA-2 timescale sensitivity



Seasonal fluctuations



Available information for Water Inputs



Climate-driven Hydrologic Model: HYDROTREND 3.0

BASIC EQUATIONS:

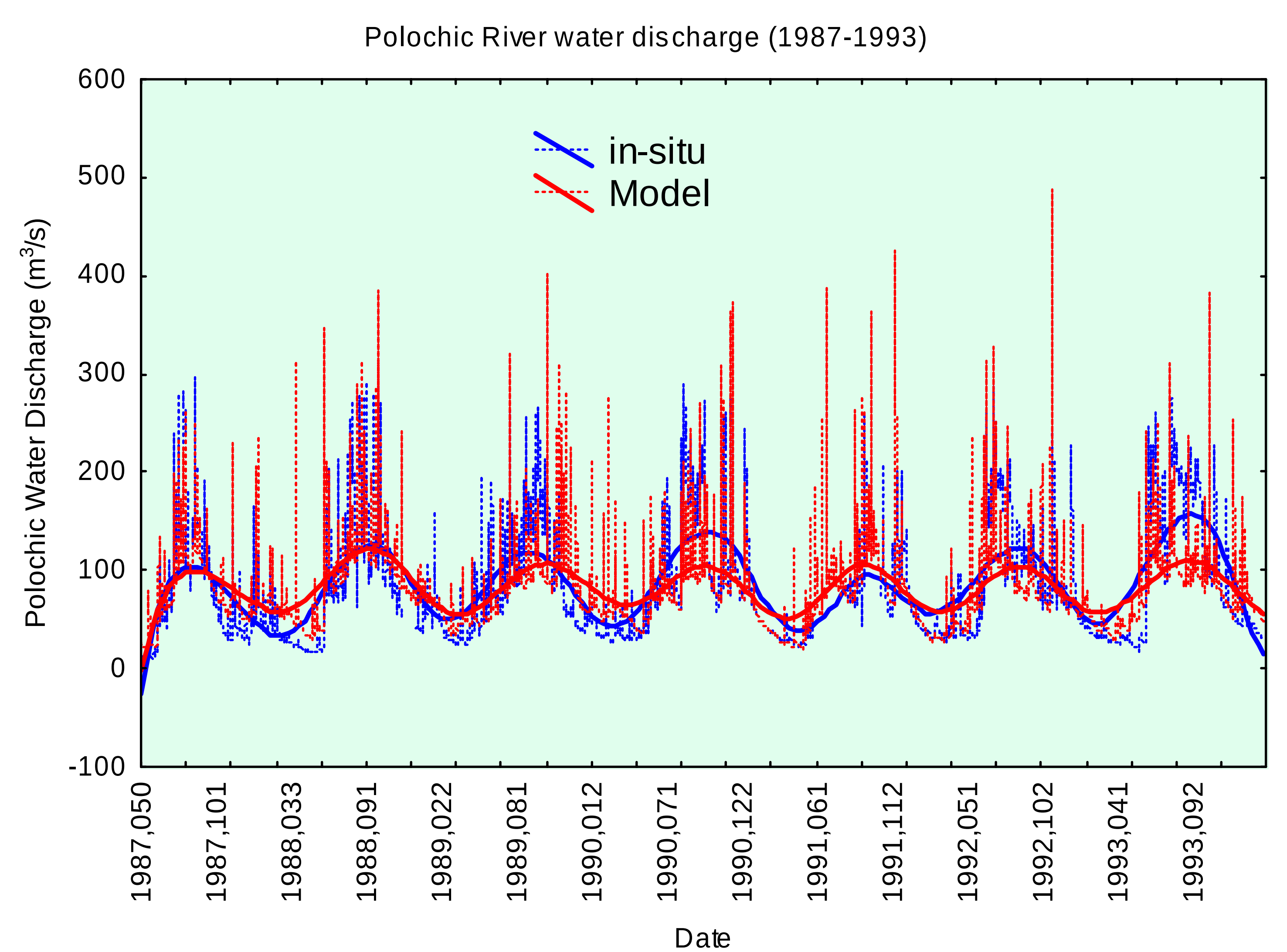
$$Q = A\sum_{i=1}^{ne}\left(P_i - Ev_i \pm Sr_i\right)$$

$$Q = Q_{rain} \pm Q_{gw} - Q_{Ev}$$

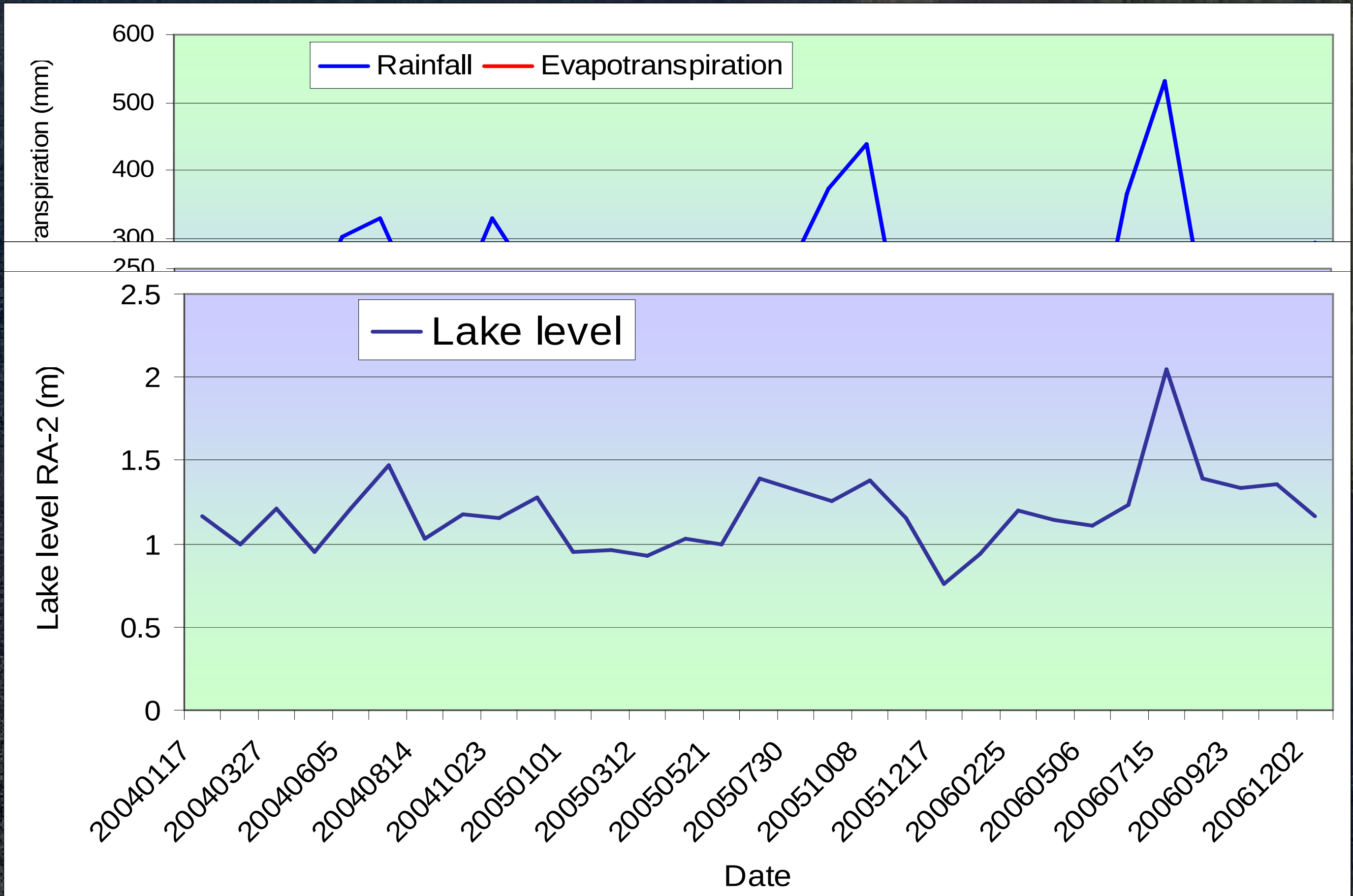
$$Q_r = q_{se} + q_{ie}$$

$$Q_{gw} = \alpha\left(\frac{GW_{store} + GW_{\min}}{GW_{\max} + GW_{\min}}\right)^{\beta}$$

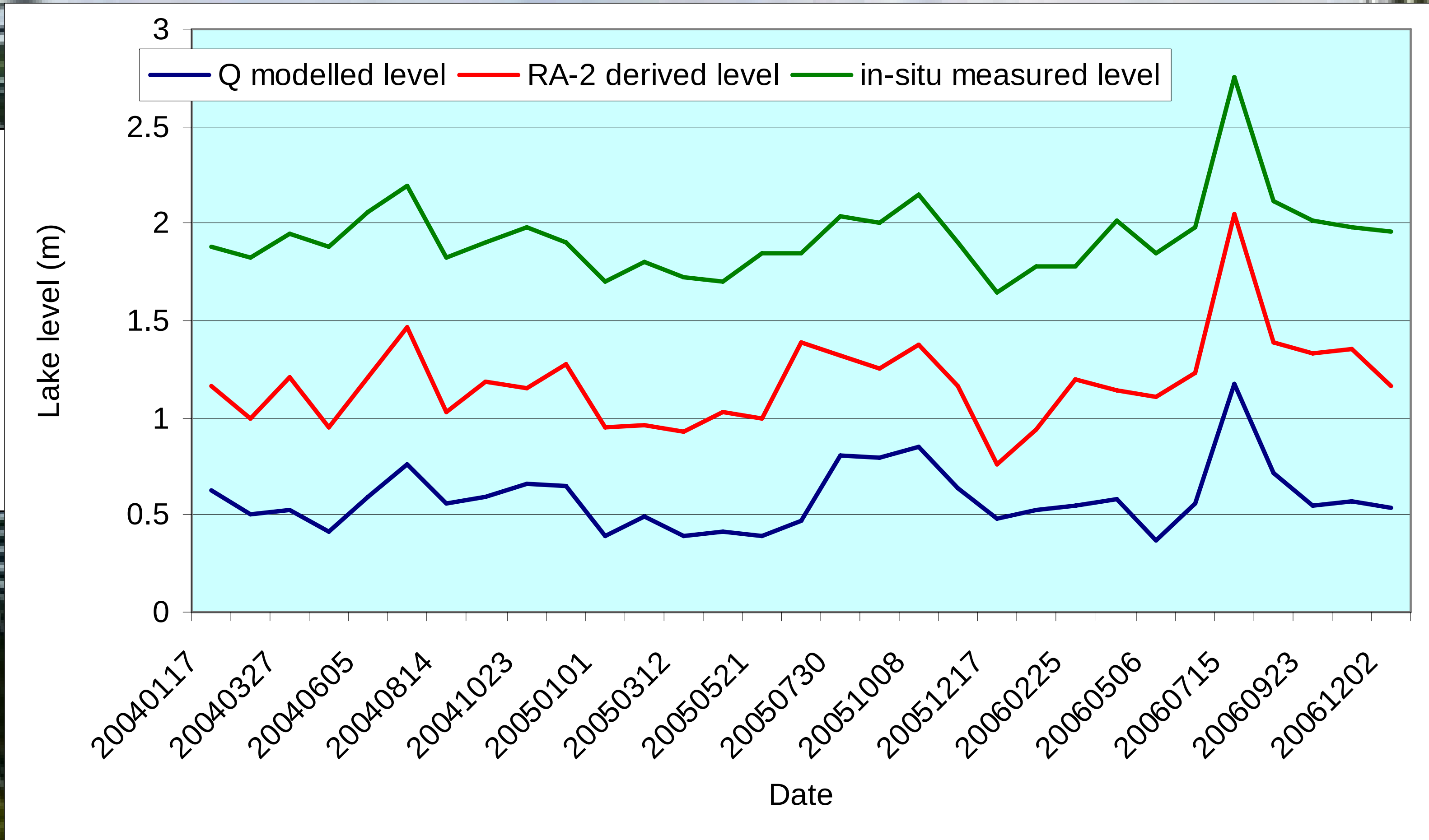
Model Validation



Relationships: Climate, water input, lake level.



From tributaries discharge to lake level variations



Conclusions

- RA-2 is highly accurate in monitoring Lake Izabal relative level variations
- Level variations are driven by climate cycle of rainy and dry seasons
- HYDROTREND is able to predict and monitor the Polochic water discharge
- Combination of remote sensing and numerical models could be used in studying Lake Izabal water storage and interchange

Work to do…

- Innundated area variations from ASAR
- Hydrologic factors forcing water discharge: soils, land use, geology, etc.
- Relationships with the Caribbean Sea level variations


Thank you!!!