

# Assessing long-term changes in annual monsoon inundations in the Mekong Delta (Cambodia): Testing an innovative approach linking remote sensing and in-situ measurements to overcome data scarcity

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**Christina Orieschnig**, Gilles Belaud, Jean-Philippe Venot, and Sylvain Massuel

# Challenge: Spatial Data Sparsity in the Mekong Delta

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- annual Monsoon inundations are essential to agro-ecosystems, from groundwater recharge to nutrient deposition
- water level measurements show that the hydrology of the Mekong Basin and Delta has changed over the past decades (cf. Yun et al. 2020, Van Binh et al. 2020)
- spatial component is missing - difficult to assess shifts in inundation patterns and dynamics
- limiting factors:
  - no precise information on elevation, especially at a local level
  - no consistent historical satellite time series
- solution: WAFL (cf. Orieschnig et al. 2022)





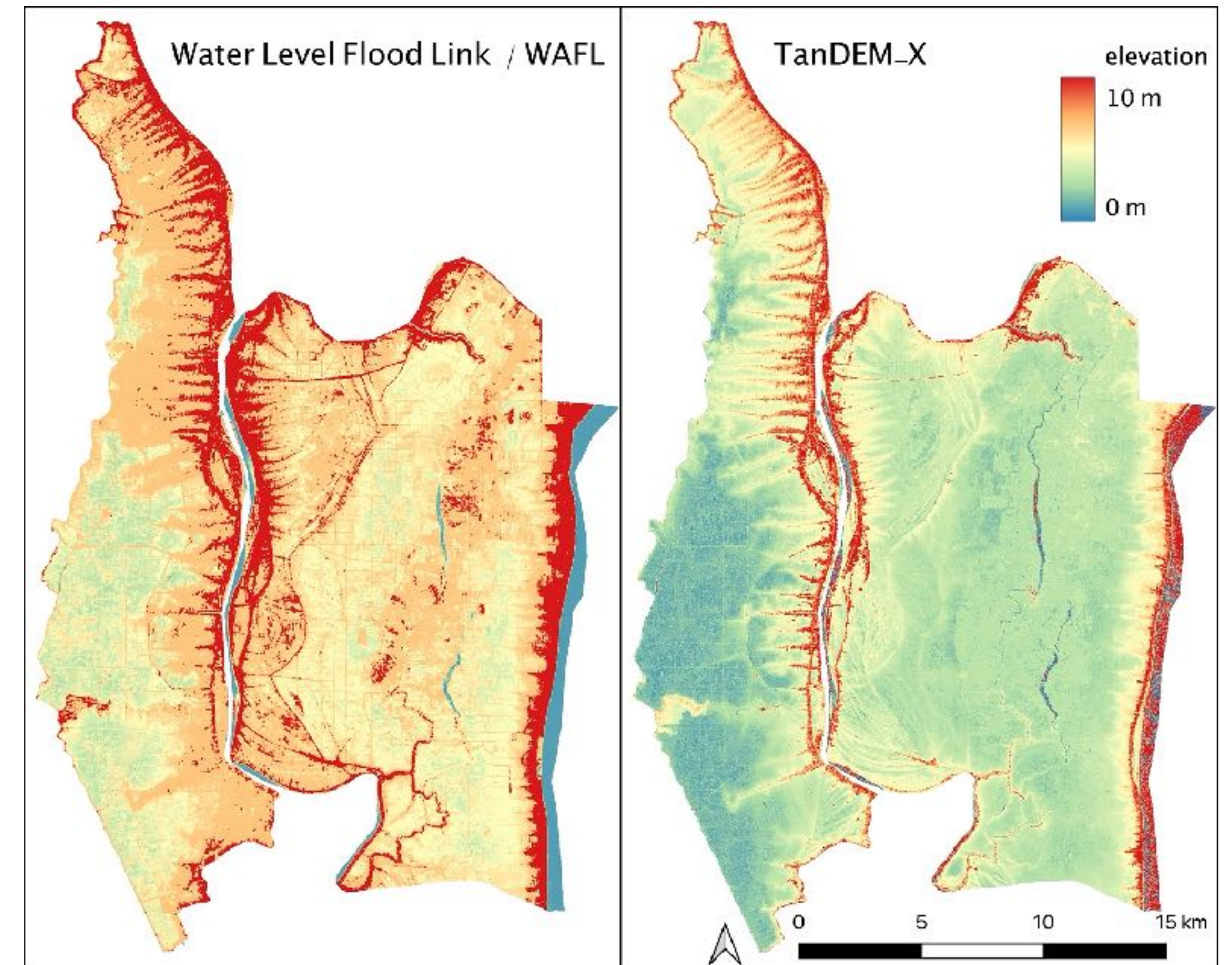
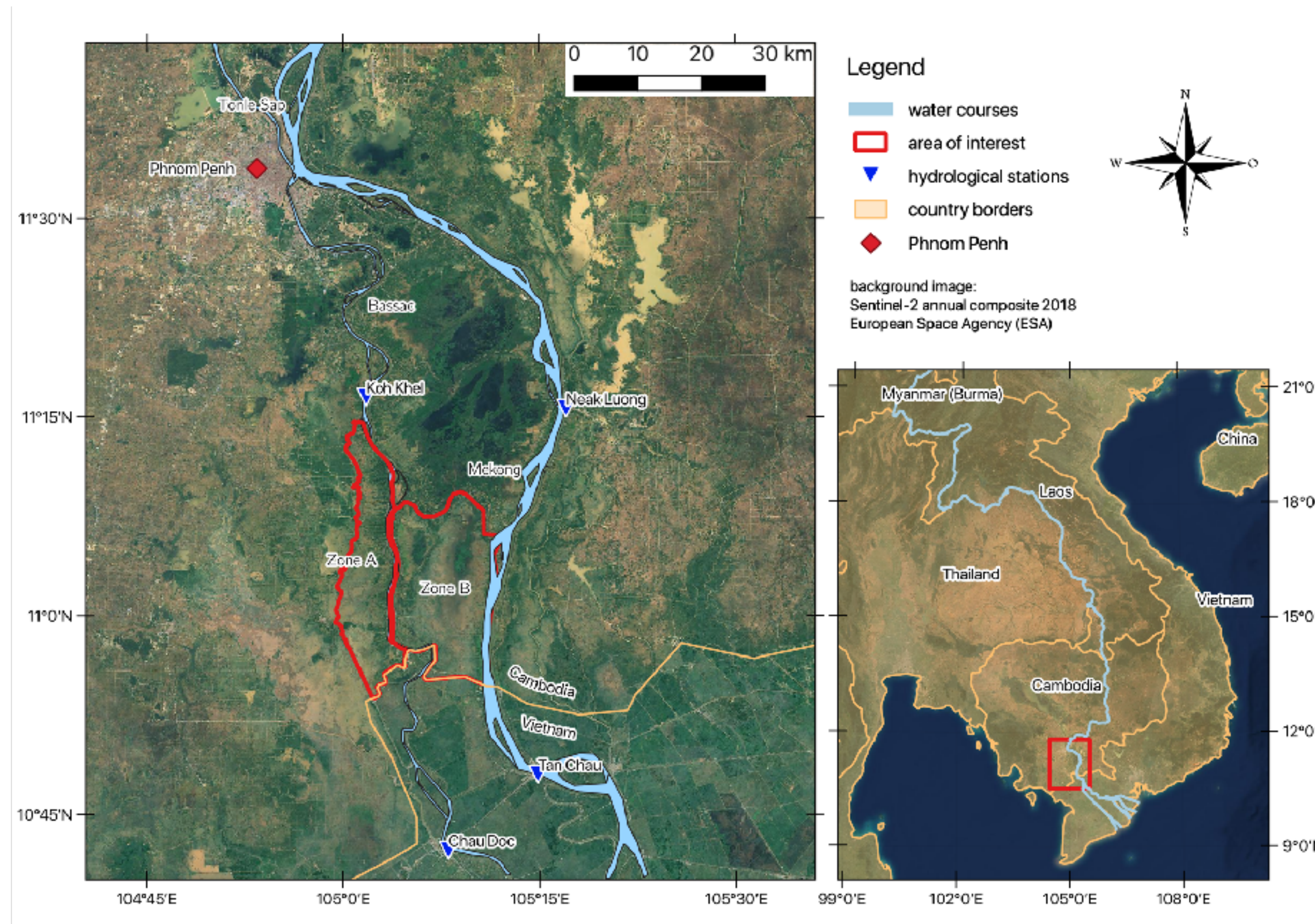
# Methodology: Constructing and Assessing WAFL

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- WAFL = Water Level - Flood - Link
- establishes correlative link between locally measured water levels and inundation maps
- inundation maps derived from recent satellite images (Sentinel-1 and -2) using unsupervised classification on GEE cloud computing platform
- Lamagat correlation model to take into account attenuation effects and delay times (cf. Lamagat et al. 1993, Bader 2016)
- allows the reconstruction of historical inundation extents based on satellite images
- comparison with the available historical Landsat wet season images, and with the high-resolution TanDEM-X 12m digital elevation model (cf. Rizzoli et al. 2017)
- calculation of changes in flood incidence, distribution, and duration pre-and post 2008 (hydrologic break point in the area)



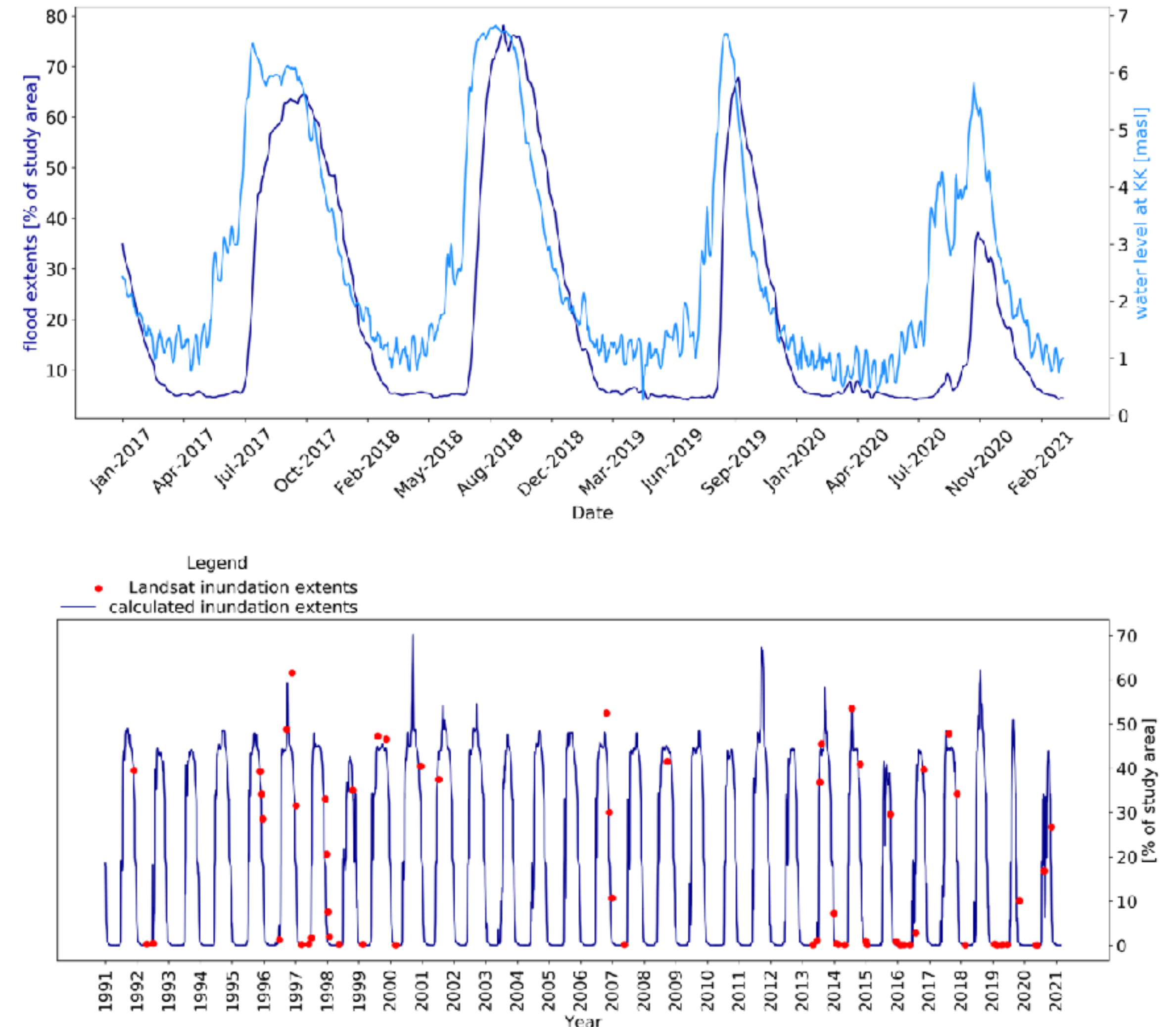
# Case Study Area





# Results

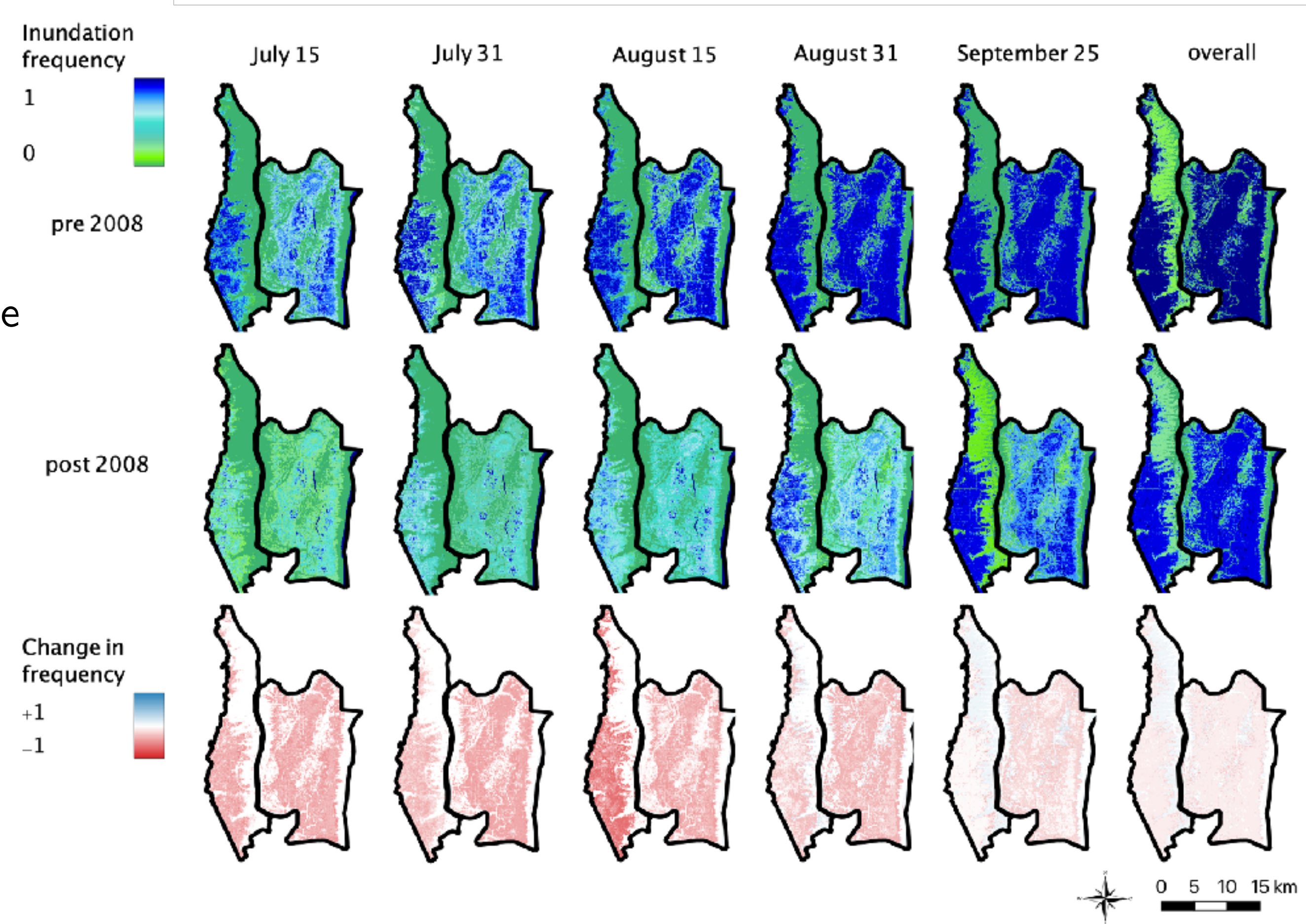
- 87.16% agreement between Landsat-derived inundation maps and WAFL-based maps
- vegetation plays major role, as do upstream boundary conditions
- hydraulic link between floodplain and river seems to have changed relatively little
- decrease of annual inundation durations of 19 days
- sharp decrease in inundation incidence in the early traditional flood season, overall flood incidence has changed relatively little
- negative impacts for agriculture, groundwater dynamics, and ecosystems, especially fish reproduction





# Results

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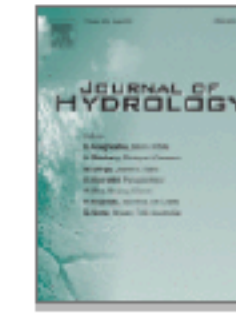




# For Further Information



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Research papers

## A multi-method approach to flood mapping: Reconstructing inundation changes in the Cambodian upper Mekong delta

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### Highlights

- Changes in flood patterns in the Cambodian upper Mekong delta are assessed.



*Thank you for your attention!*

*Questions? Feedback? Suggestions?*



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