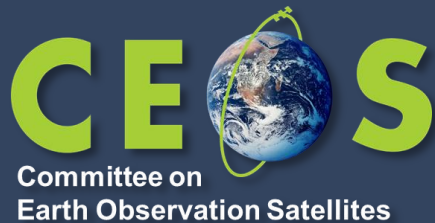


# Earth Observation for Mapping Flood Inundation Dynamics

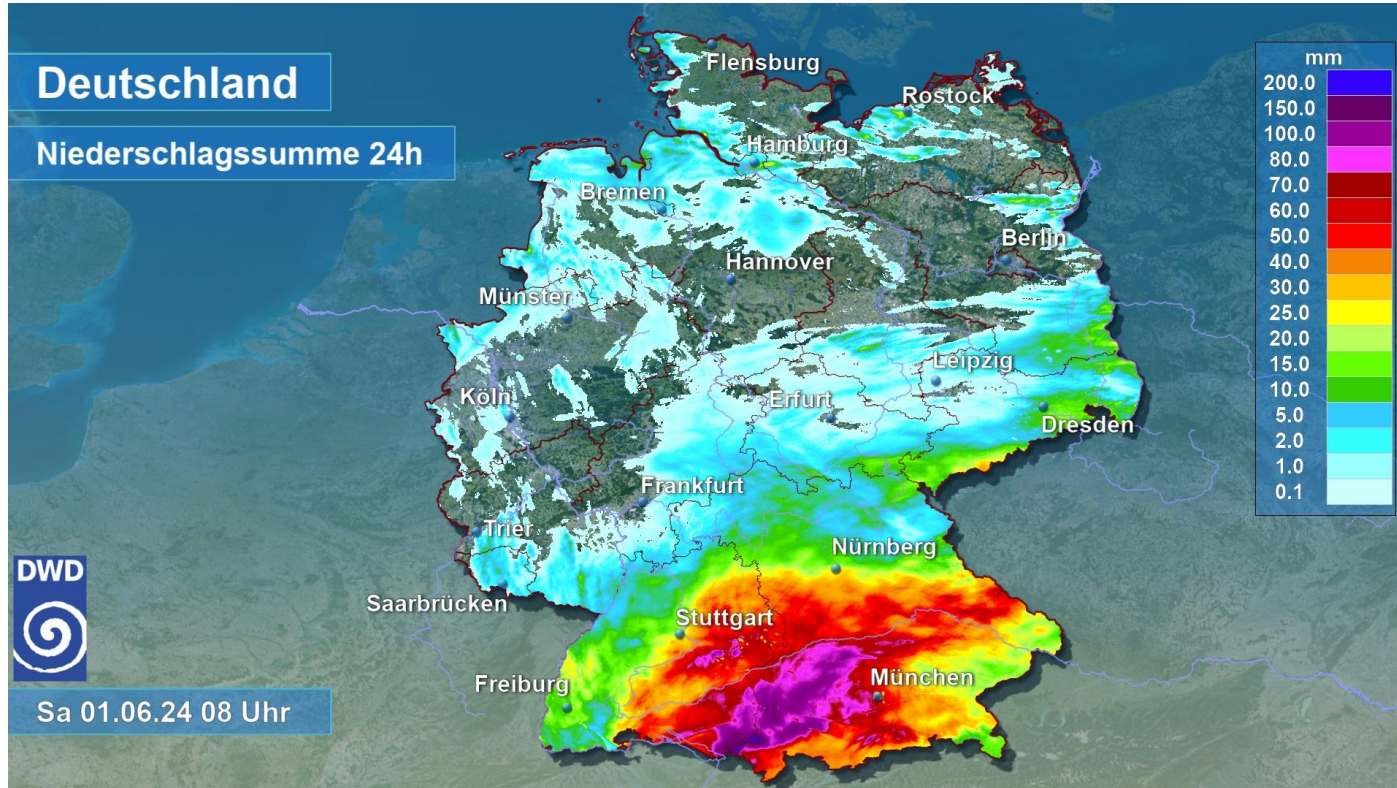


Junior Professor  
for Data-driven  
Computing in  
Civil Engineering

**RWTH**AACHEN  
UNIVERSITY

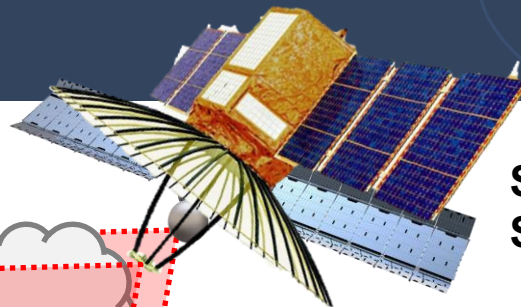
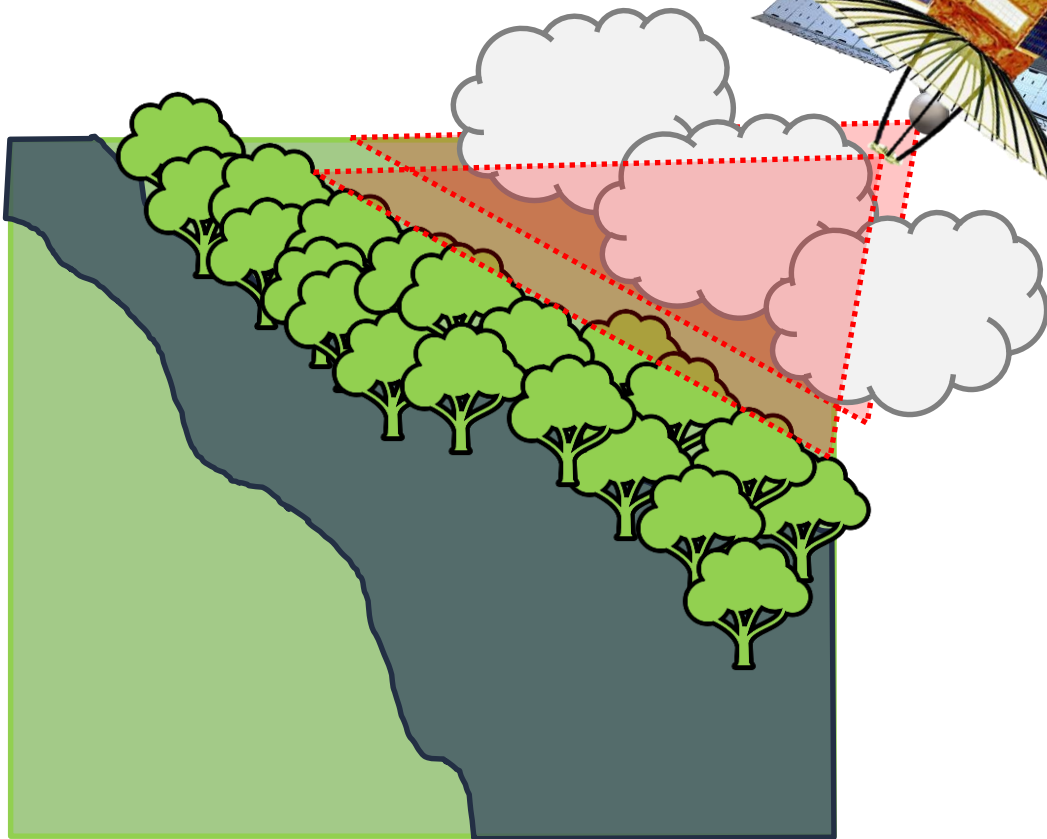
**Prof. Dr. Antara Dasgupta,  
Junior Professor of Data Driven  
Computing in Civil Engineering,  
Agenda Item 6.5  
WGISS-61 and WGDisaster-25  
16-20 March, 2026  
Dehradun, India**

# Why do we need to track floods from



24-hour precipitation total from Friday morning, 31.05.2024 08 CEST to Saturday morning, 01.06.2024 08 CEST  
(Source: DWD German Weather Service)

# Why radar satellites?

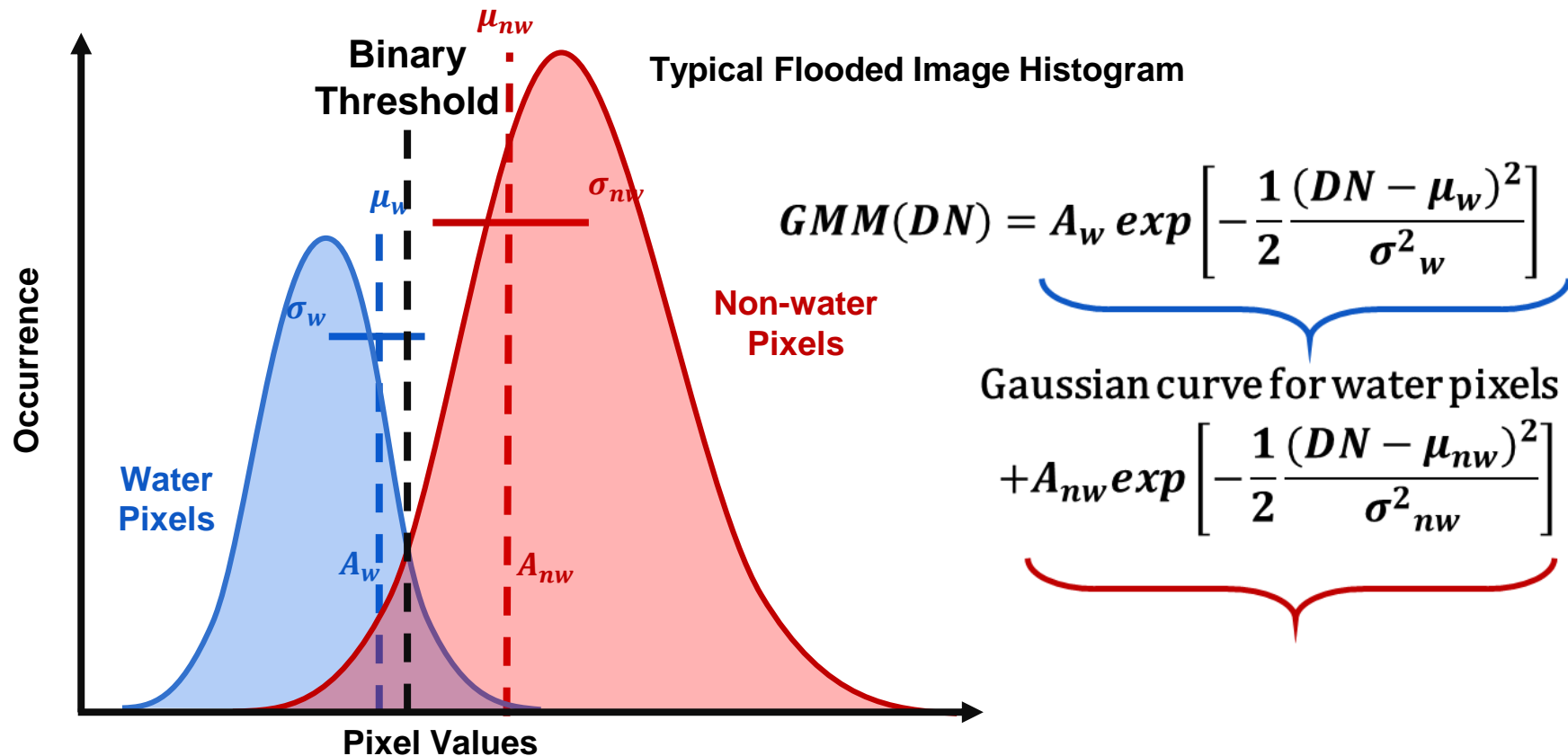


SAR  
Satellite

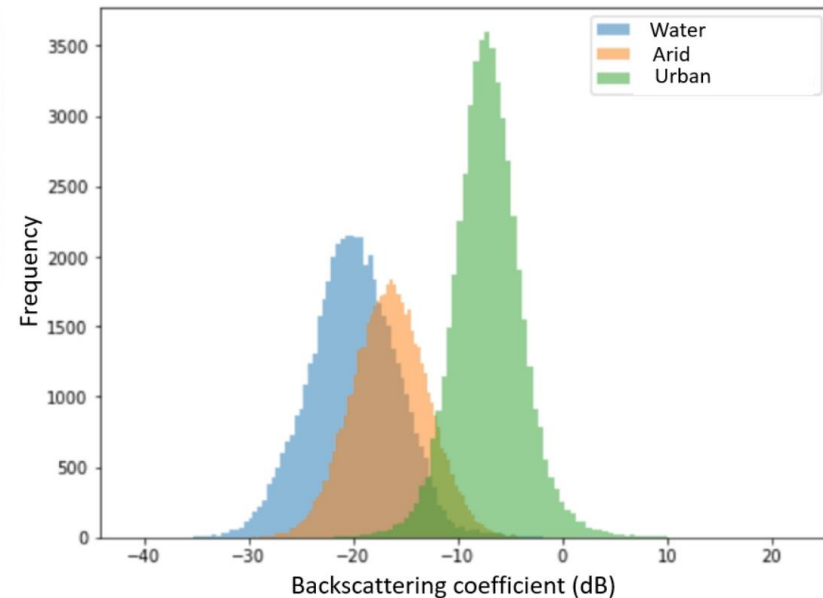
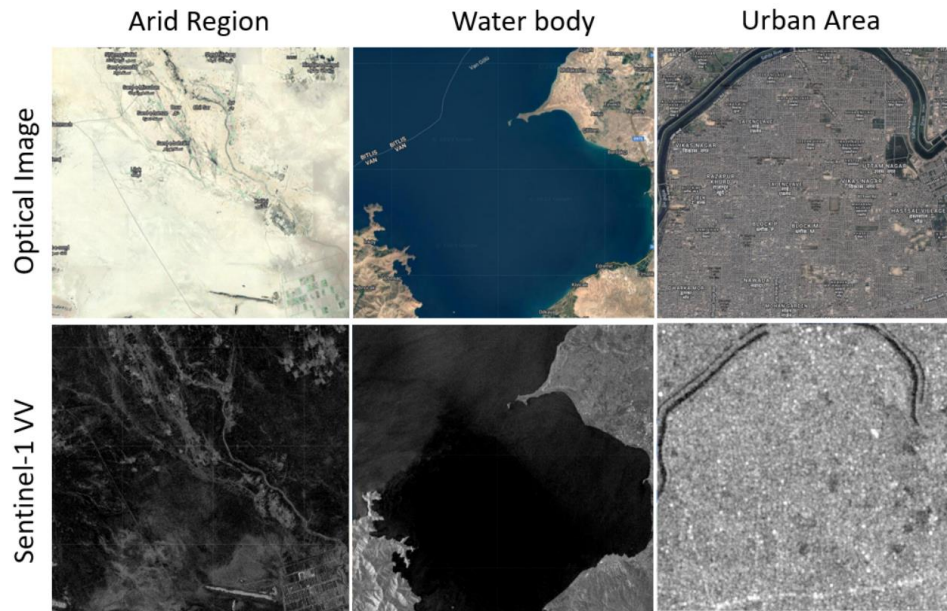
Optical  
Satellite



# Traditional SAR-based Flood Mapping



# Flood Detection in Arid Regions

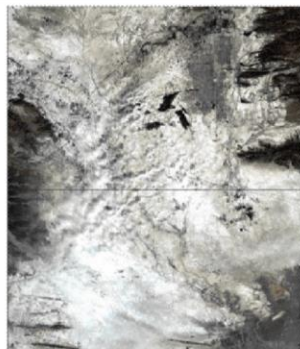


Garg, Shagun, et al. 'Unlocking the Full Potential of Sentinel-1 for Flood Detection in Arid Regions'. Remote Sensing of Environment, vol. 315, Dec. 2024, p. 114417.

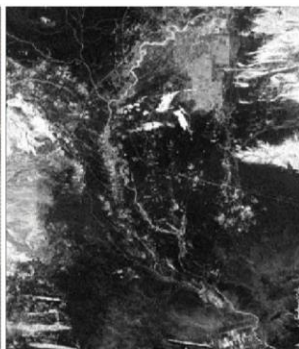
# Flood Detection in Arid Regions



Iran



S2 pre (08 Jan 20)



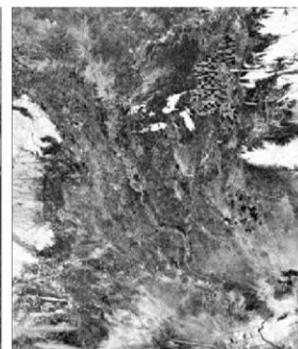
VH Pre (01 Jan 20)



VV Pre (01 Jan 20)



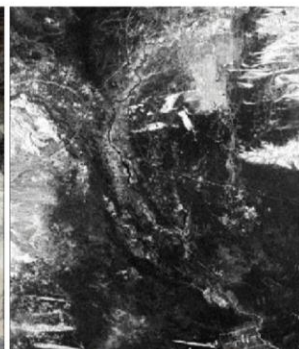
Pre CohVH  
(20 Dec 19 - 01 Jan 20)



Pre CohVV  
(20 Dec 19 - 01 Jan 20)



S2 post (13 Jan 20)



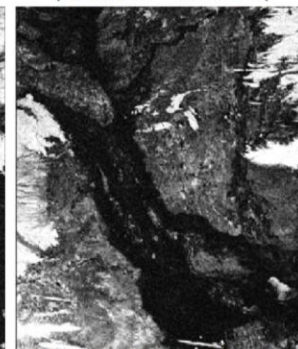
VH Post (13 Jan 20)



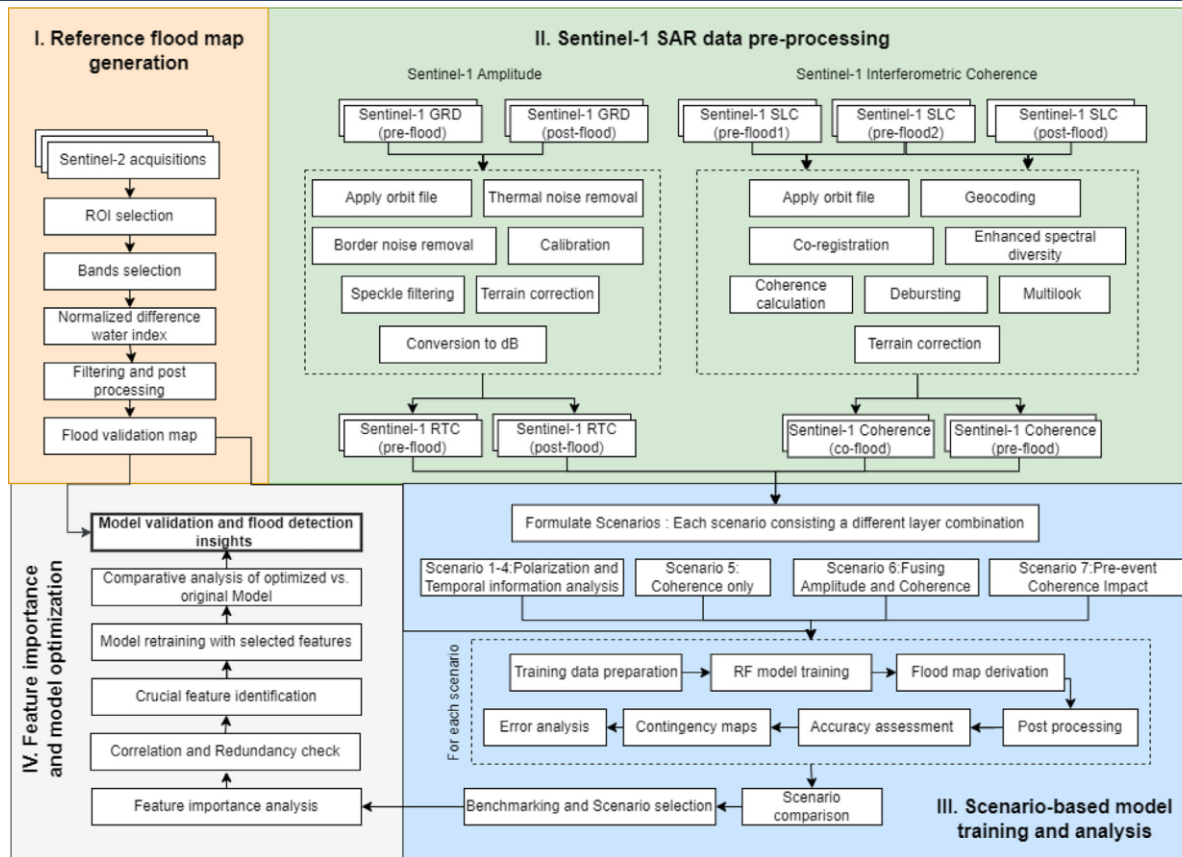
VV Post (13 Jan 20)



Co-event Coh VH (01-13Jan)



Co-event Coh VV (01-13Jan)

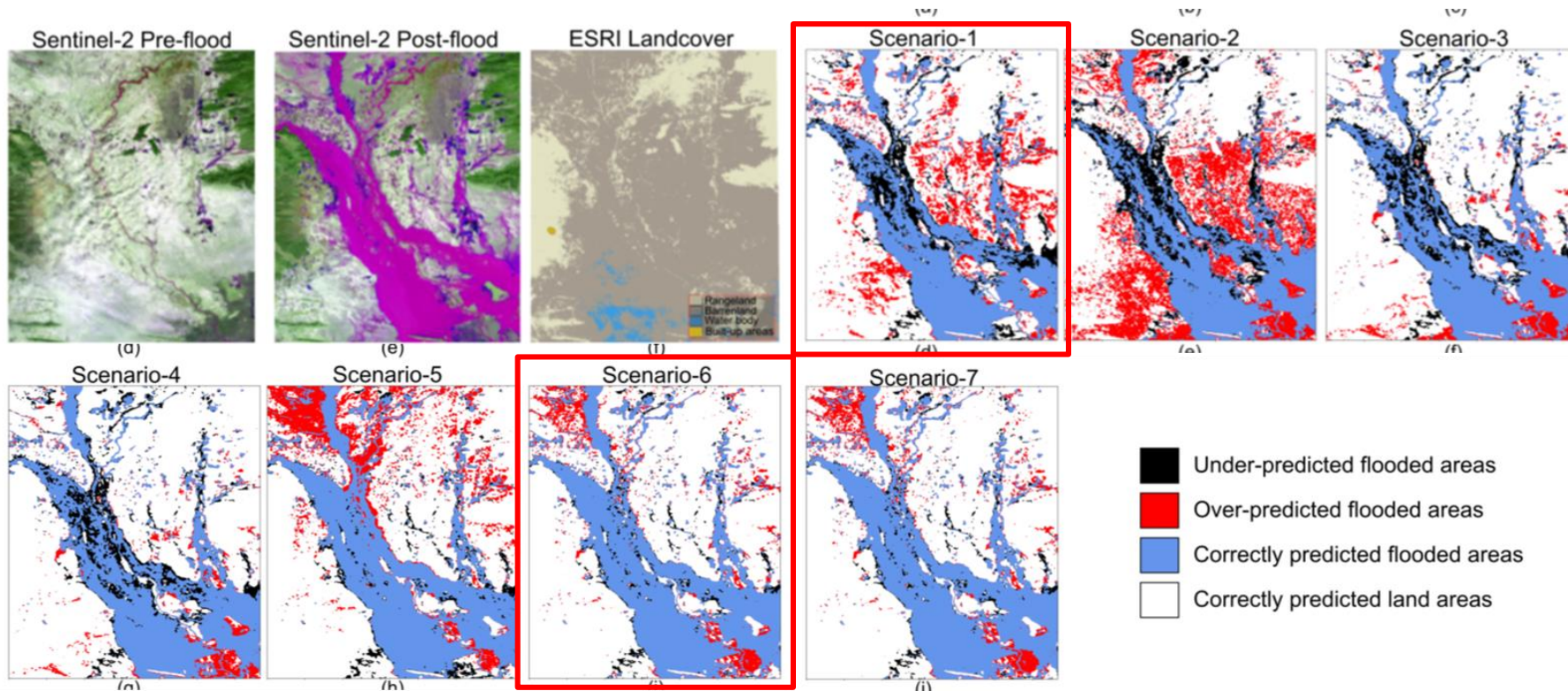


# Experimental Scenarios



	VV Pre	VH Pre	VH Post	VV Post	Co - Coh VV	Co - Coh VH	Pre - Coh VV	Pre Coh VH	No. of layers
Scenario 1			✓	✓					2
Scenario 2		✓	✓						2
Scenario 3	✓			✓					2
Scenario 4	✓	✓	✓	✓					4
Scenario 5					✓	✓			2
Scenario 6	✓	✓	✓	✓	✓	✓			6
Scenario 7	✓	✓	✓	✓	✓	✓	✓	✓	8

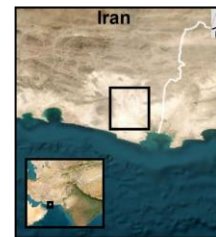
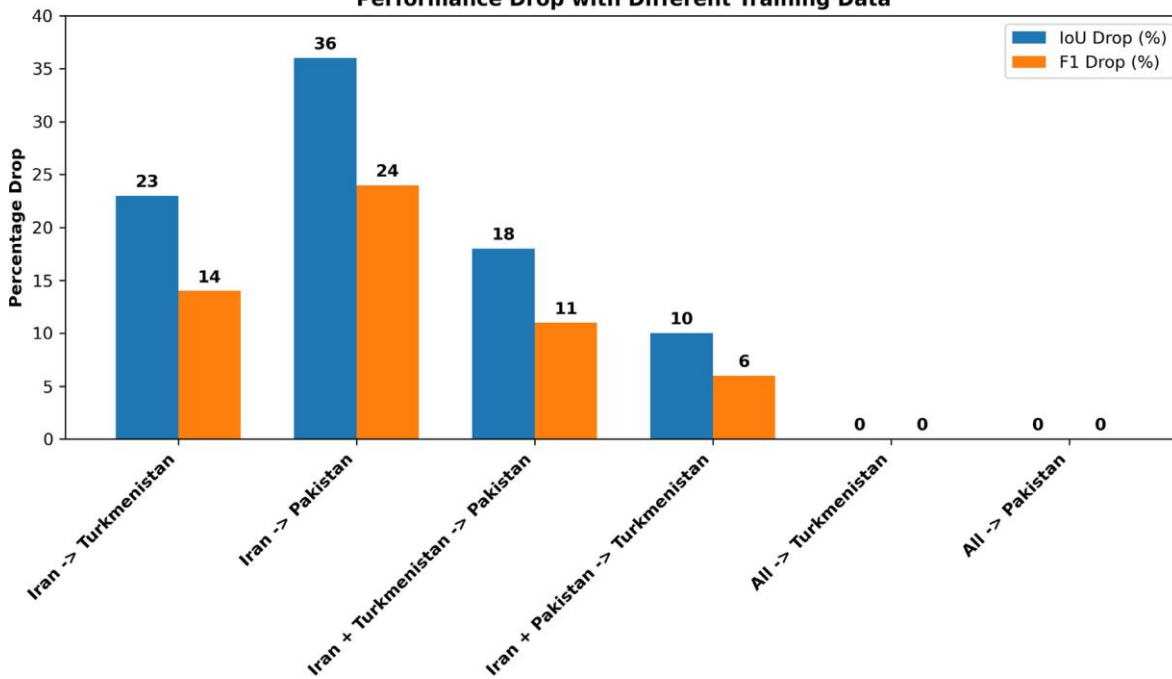
# Validating the Flood Maps



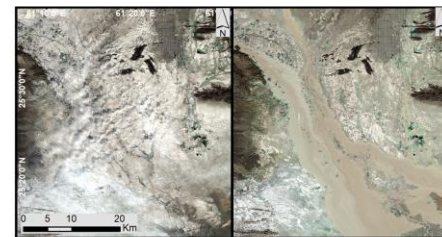
# Model Transferability



Performance Drop with Different Training Data



(a)

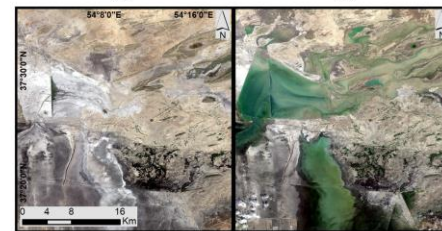


(b)

(c)



(d)

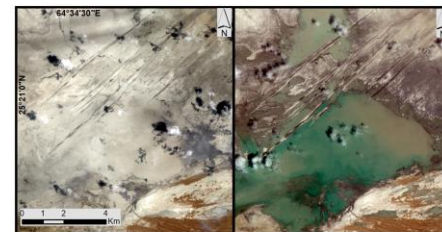


(e)

(f)



(g)



(h)

(i)

**Co-event SAR coherence improved flood mapping in arid regions.**

**Optimizing the feature improved model run time while preserving accuracy.**

**First possibilities for arid flood mapping on a global scale demonstrated**

A white circle with a thin blue outline, connected to the text box by a blue line that extends upwards and to the left.

**Leverage deep learning to improve transferability and computational efficiency of arid region flood mapping algorithms.**

A white circle with a thin blue outline, connected to the text box by a blue line that extends upwards and to the left.

**Evaluate the potential of foundation models and zero shot models such as SAM for SAR-based flood mapping.**

A white circle with a thin blue outline, connected to the text box by a blue line that extends upwards and to the left.

**Improve operational reliability of ML-based flood mapping algorithms through global training and benchmarking.**