SPACE INNOVATION CHALLENGE 2026 · FINAL

Anvīkṣaṇa

DGGS-native Earth intelligence for reservoir operations under a non-stationary monsoon

In plain terms: satellite observation turned into reservoir release decisions, for a monsoon that no longer repeats.

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PROVENANCE-LED PLANETARY INTELLIGENCE

APRSAF-32 · Bangkok · 26 October 2026

One reservoir, blamed for the flood in August and the drought in March

HOLD THE WATER

No freeboard when the cloudburst arrives. The emergency release enters a channel already carrying direct runoff.

RELEASE EARLY

Below the storage needed for committed irrigation and municipal supply eight weeks later.

Separate institutions handle the two failures, on separate timescales. Nobody owns the trade-off between them.

WHY SPACE, AND NOT SOMETHING ELSE

The state of the basin cannot be read from the ground

Storage is never measured

A gauge reports water level at one point. Nothing on the ground reports catchment saturation or how much of the command area is already under water. The central variable in the decision is an estimate.

The flood arrives at night, under cloud

The Chao Phraya peaked in darkness under monsoon cloud. Optical sensors returned nothing. X-band SAR measured 114.6 km² of open water along 70 km of the reach, at 03:08 local time.

The decision window is hours

Four satellites covered the basin in 7 hours 39 minutes. A six-day repeat cycle rarely coincides with a flood peak that evolves over hours.

Take the satellites away and the release decision goes back to a rule curve fitted to rainfall statistics that no longer hold.

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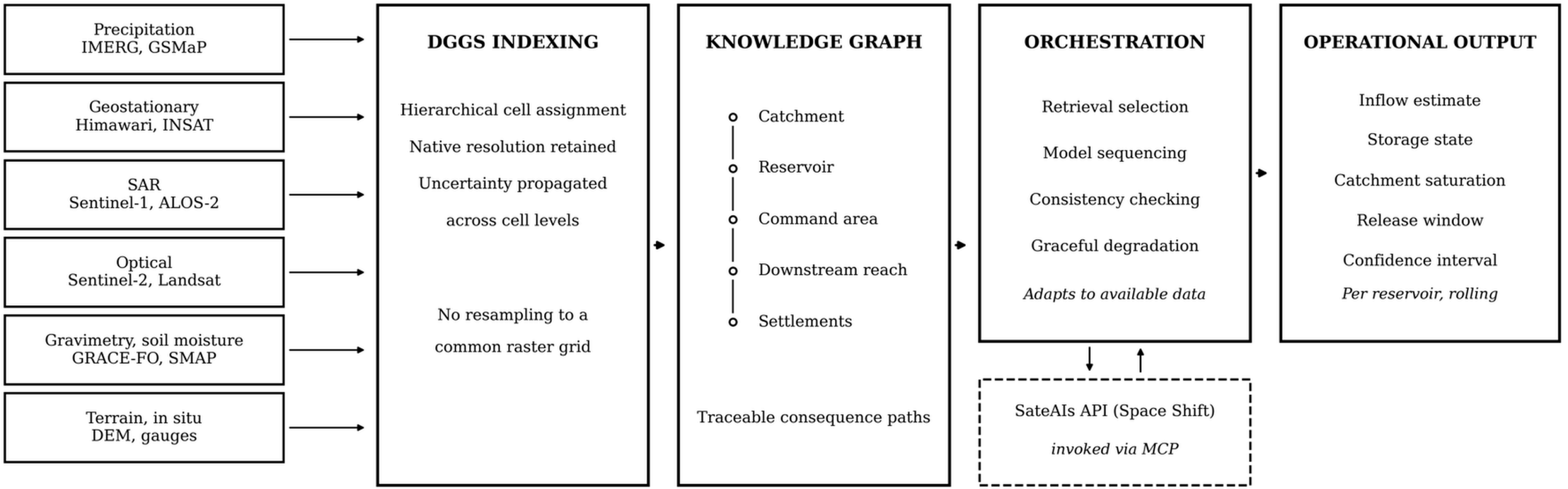
How an observation becomes a release decision



The output is a release window with a stated confidence, not another dashboard layer.

Three rules the system is built on

Index, do not resample

Hierarchical cells let 10 km precipitation and 10 m SAR coexist at their own resolutions, each carrying its uncertainty.

Reason over relationships

Catchment, reservoir, command area, reach and settlement are connected entities in one ontology, so every number carries its provenance back to the observation it came from.

Orchestrate what is observable

The pipeline is assembled from what the monsoon leaves visible, so a missing sensor widens uncertainty rather than stopping output. Third-party services are called as tools in the same layer: Space Shift's SateAIs runs over the Chao Phraya through its MCP interface, returning into the same grid.

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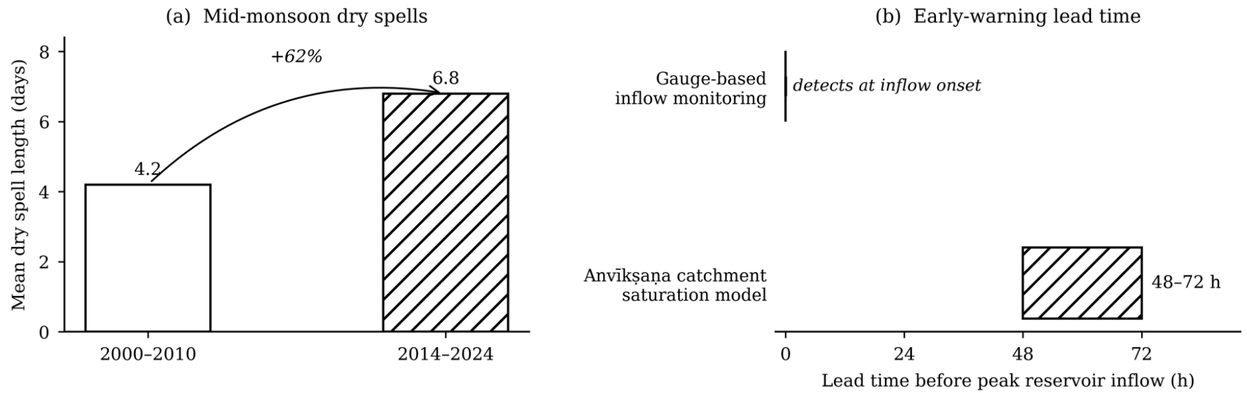
VALIDATED, KRISHNA BASIN, INDIA

Dry spells are lengthening, and the warning arrives too late



Mid-monsoon dry spells, Telangana

4.2 days in 2000 to 2010, 6.8 days in 2014 to 2024. Extreme-event frequency rises significantly across the upper and middle sub-basins.

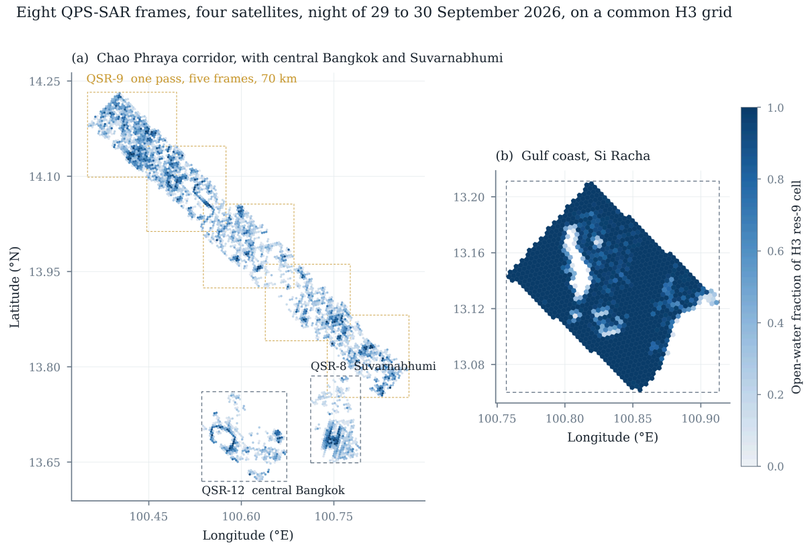
Nagarjuna Sagar pilot

Satellite-derived catchment saturation flagged anomalous upstream conditions 48 to 72 hours before peak inflow. Gauges registered the surge only as water entered the reservoir.

Source: author, 9th India International Water Week, Central Water Commission, September 2026.

EIGHT IQPS FRAMES · NIGHT OF 29 TO 30 SEPTEMBER 2026

Four satellites, seven and a half hours, one grid



Includes material © 2026 iQPS, Inc. L1.1 StripMap HH, 12 by 12 multilook (50 to 72 equivalent looks), GCP-geocoded; single-date amplitude threshold.

8
frames from four satellites

7h 39m
21:07 to 04:46 Bangkok time

26.7 to 35.8°
incidence span, both look sides

H3 11
indexed, reported at resolution 9

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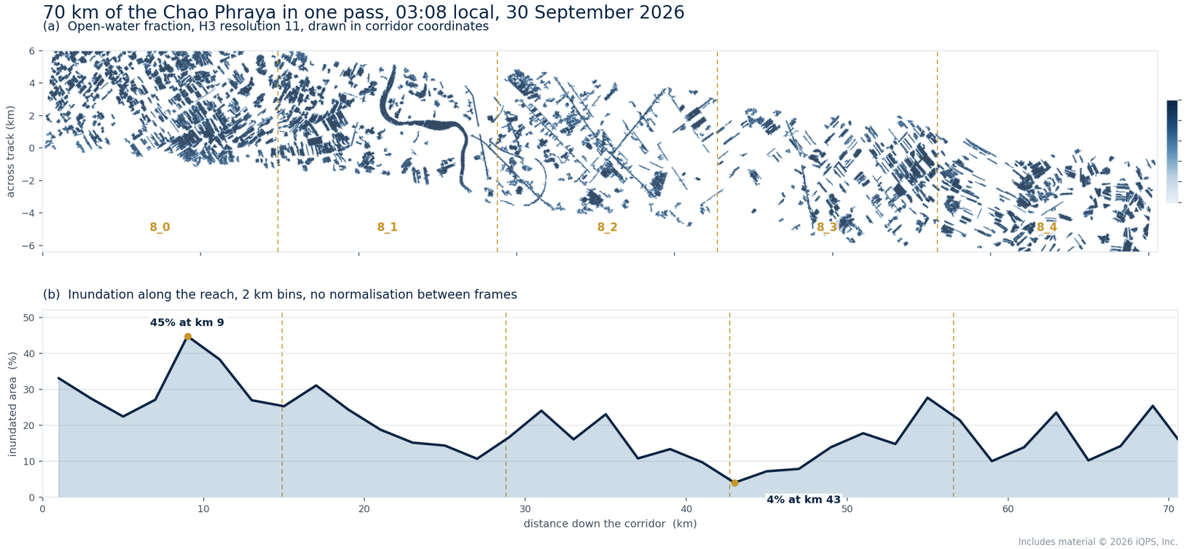
FIVE FRAMES, ONE PASS, ONE LOOK GEOMETRY

70 km of the Chao Phraya, measured end to end



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114.6
km² inundated of 590 km² observed

45%
peak, 9 km downstream

4%
minimum, 43 km downstream

26.72°
incidence on every frame

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What today's observation cannot give an operator

LIMITATION	WHAT IT COSTS THE DECISION
Storage is inferred, never measured	No mission observes reservoir level at useful cadence across monsoon Asia. The central variable is an estimate.
Revisit against event timescale	A six-day repeat rarely coincides with a flood peak that evolves over hours.
No pre-event reference at matched geometry	Coherence would separate flooded ground from radar shadow, but repeat-pass interferometry is not yet an operational product from the new SAR constellations, so no matched archive exists to compare against.
Precipitation resolution	Roughly 11 km, coarser than the command areas and the convective cells that matter.
Soil moisture scale	Antecedent saturation known only as a regional average, against command areas of a few kilometres.
Accessibility	The observations that would help most are least available to the agencies that need them.

FUTURE OBSERVATION AND SERVICE NEEDS

The most useful new service is not a sensor. It is a contract.

When an analytical system detects that a basin has crossed a defined state threshold, it should be able to trigger a SAR acquisition automatically, against a pre-agreed allocation, delivered inside the decision window.

Today's shape

A human requester and a procurement cycle, for an event whose value decays over hours.

What changes

Public water agencies that cannot justify a standing subscription become reachable customers.

What it costs

No new hardware. A different delivery model for capacity already in orbit.

Demand that is unpredictable in timing but predictable in volume. On-board inference, our Ātmanetra work, is the other half: downlink the water mask, not the scene.

Proven on one river basin, built to move to the next

Nothing in the method is tied to one basin. The inputs are available across the region, so moving to a new basin costs local calibration and time with the agencies that run it, not a rebuild. The Krishna, the Chao Phraya, the Mekong and the Irrawaddy are the same problem.

What we are asking for

A tasking partner willing to pilot event-triggered allocation on one monsoon basin, next season.

What we bring

A working grid-and-graph stack, government stakeholders already engaged, and multi-year validation behind it.

Where to find me

Here all week. Subject matter expert for WG2 at the SGAC Asia-Pacific workshop, 24 and 25 October. Presenting again tomorrow at the Global Moon Village Workshop.

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Reservoir operating rules were written for a climate that has changed

WHAT RULE CURVES ASSUME

Seasonal storage targets fitted to twentieth-century inflow statistics, on the assumption that the past predicts the future.

WHAT THE RECORD NOW SHOWS

Totals have changed less than their arrangement in time. The same water arrives in fewer, heavier events, with longer dry spells between them.

The operator's decision window has narrowed, and the rules that govern it were written for a different distribution.

THE GAP THIS CHALLENGE ASKS ABOUT

The information already exists. It does not reach the person making the decision.

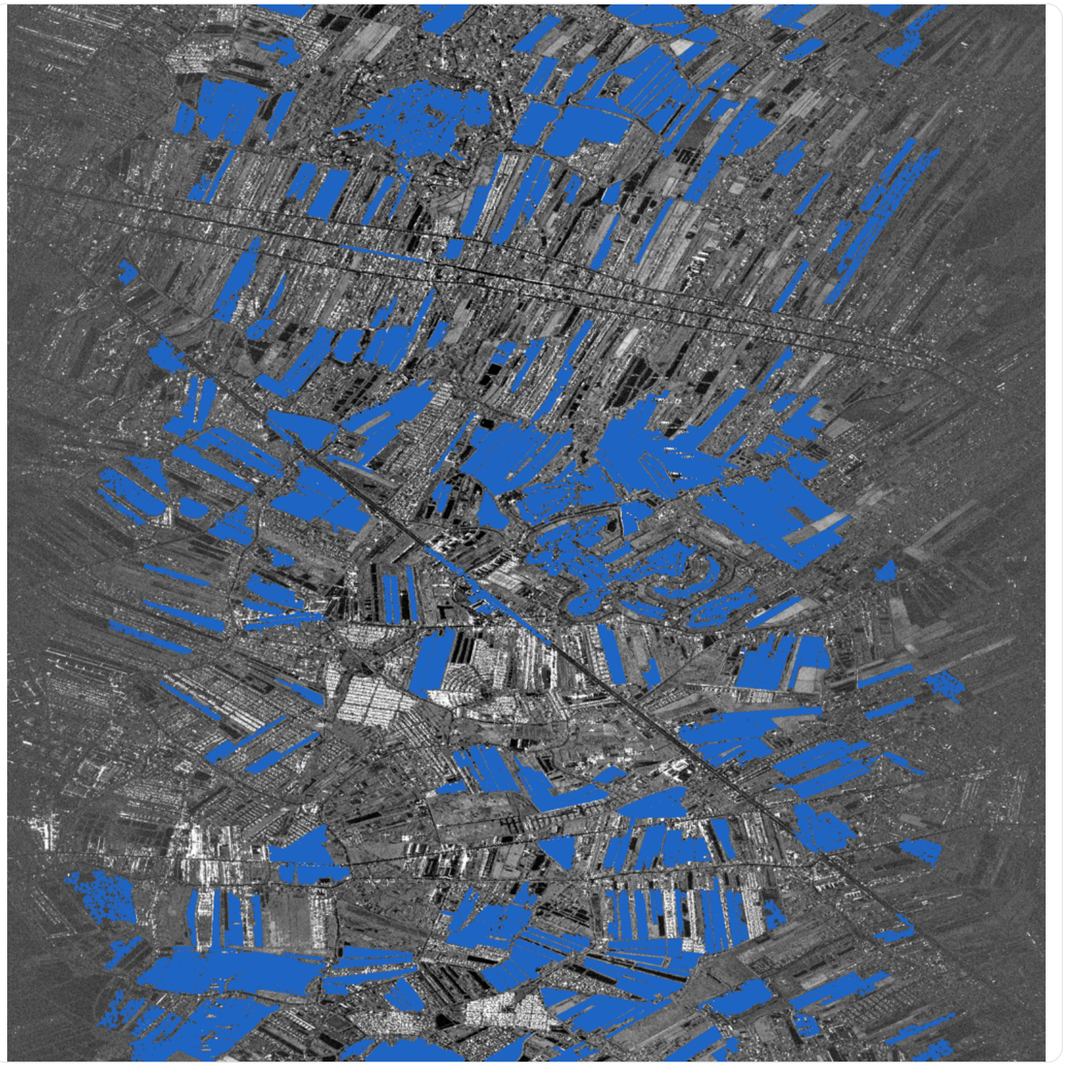
Precipitation
GPM, GSMaP, Himawari, INSAT

Water extent
SAR, optical

Storage, wetness
GRACE-FO, SMAP

Terrain, in situ
DEM, gauges, bulletins

A dozen observation systems, each correct, none assembled at the cadence a release decision needs.



MIN BURI · NONG CHOK · 03:08 LOCAL, 30 SEPTEMBER

The flooded areas stop at the field boundaries

Flooded paddy and aquaculture in eastern Bangkok, resolved field by field. Water that stops at field edges is water, not noise. The mask is following the field pattern, not the speckle.

This is the command-area layer of the graph: the surface that determines whether a release reaches the farmer or drowns the crop.

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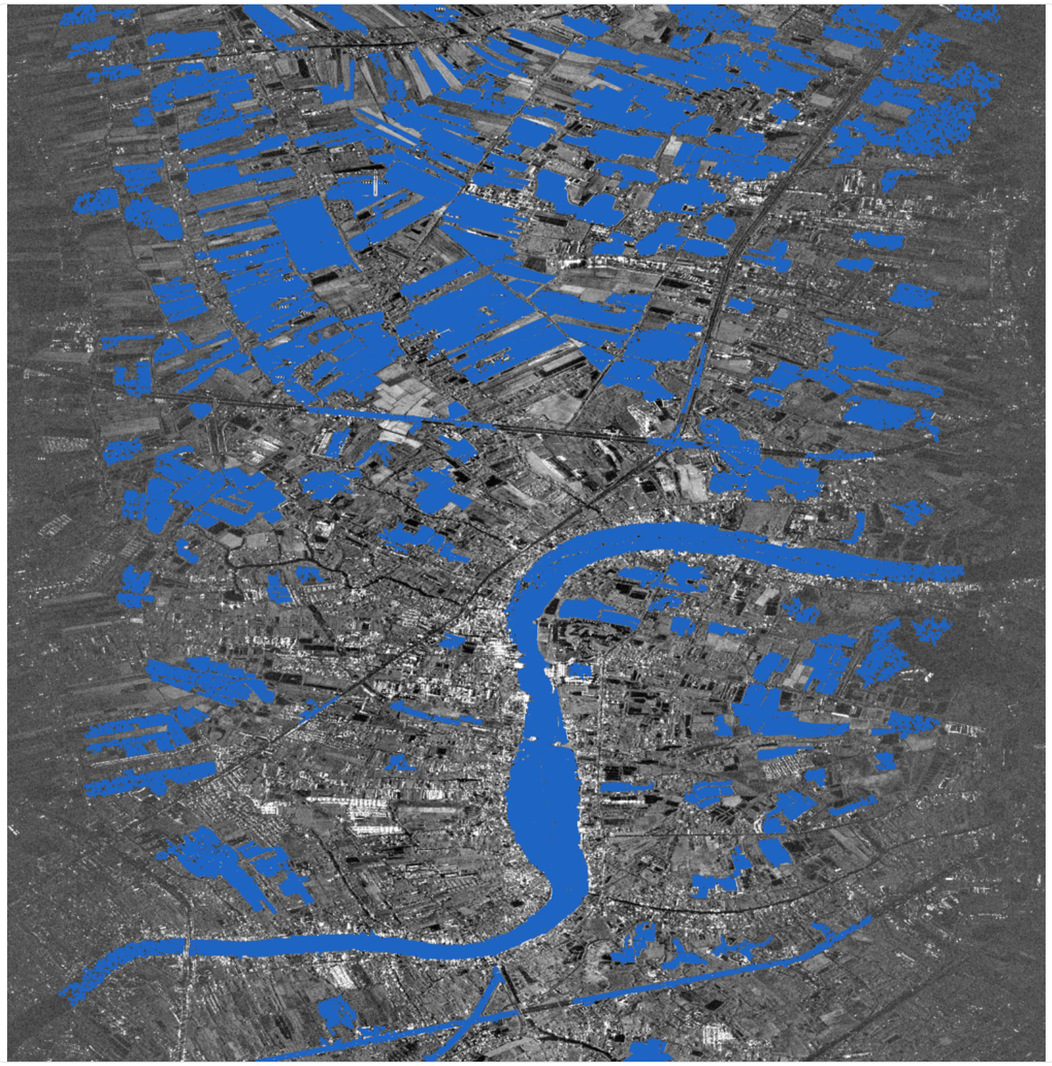


CHAO PHRAYA REACH · 03:08 LOCAL, 30 SEPTEMBER

The river and the fields it feeds, in one frame

19.8 km² inundated, the largest of the inland scenes. The river resolves cleanly down the middle, and the flooded fields sit either side of it.

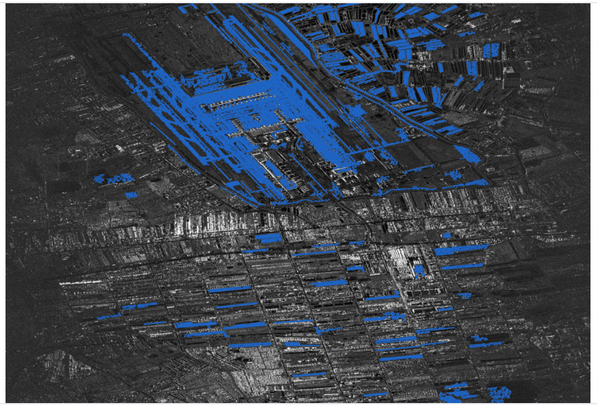
This frame and the Min Buri frame are consecutive along one QSR-9 pass, nine seconds apart at the same look direction and the same 26.7° incidence. Those two figures are therefore directly comparable, with no incidence-angle correction needed between them.

iQPS released the rest of the pass on 2 October. The next slide is all five frames, 70 km of the reach measured on one geometry.

Includes material © 2026 iQPS, Inc. · Scene supplied by iQPS on request, 2 October 2026.

SUVARNABHUMI · THE HONEST RESULT

The runways look like water to radar, and no threshold can fix that



Why it happens

Smooth tarmac is specular at 36° incidence. It returns almost nothing to the sensor, exactly like open water. Backscatter alone cannot separate them.

Why the graph exists

A system that knows the polygon is a runway suppresses the detection and keeps the flooded fields south of it. That is the knowledge graph doing its job, shown rather than claimed.

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Thank you

iQPS, for the QPS-SAR acquisition over Bangkok and for answering our calibration questions in writing.

Space Shift, for the SateAIs API and its MCP interface.

Japan Space Forum, UNISEC-Global and Kyutech, for the Space Innovation Challenge and for the invitation to Bangkok.

Scan for my contact card

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