

Flood Foresight: Real-time and forecast decision support system DARE Workshop | 22 November 2017

Overview

- Background and rationale
- Flood Foresight
- India pilot
- Validation
- Data assimilation

The 'common operating picture'



- Common data for multiple sectors
- Shared service opportunities for value-add data integrators
- International in scope
- Potential for DA to improve data



Develop a system that generates real-time and forecast view of flooding as it evolves

Modelled + EO approach

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Near real-time and forecast rainfall and flood data for riverine flooding

Enables flood early warning and improved targeting of mitigation and response activities

Global flood hazard maps

- High resolution maps available
- 30m storm-surge, fluvial and pluvial flood maps available
- 30m fluvial and pluvial flood maps available
- Not mapped

Simulation Library approach

Flood Foresight framework

Flood Foresight services

FLOOD MONITORING

- National scale flood footprints
- Driven by near real-time river gauge data
- Extent & depth data
- Current status of flood
- 3-hourly updates (GB)

FLOOD FORECASTING

- National scale flood footprints (for any country)
- Driven by rainfall-runoff model
- Extent & depth data
- Current & forecast (0-10 days)
- Daily updates

Data available through Web-App, API or FTP download

flow/level

Current status & future plan

Rainfall Screening

- Europe currently available
- Other continents can be configured

Flood Monitoring

- GB currently available
- International pilots as data availability allows

Flood Forecasting

- UK & IRL currently available
- India pilot completed
- Can be configured internationally

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India demonstration

India - Third Wave of Flooding Hits Assam,

Bangladesh - Rivers at Record High, Floods

2 Million Affected

Affect 1.3 Million

- Brahmaputra river basin deployed in one week:
 - 30 metre resolution flood footprints
 - Daily updates
 - 0-7 day forecast
 - Ensemble forecast (fluvial) allowing uncertainty and likelihood assessment
- Validation using EO data

Flood Foresight inundation footprint (16 August 2017)

Results – flood peak animation

Click image to animate

Use of probabilistic footprints to assess the confidence of the forecasts at longer lead-times

Higher probability (dark colours) shows greater agreement of the ensemble and therefore higher probability of flooding. It is essential to understand uncertainty when used in public alert systems.

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Storm Desmond - West Coast Main Line

Network Rail said a full assessment of the damage will take place as soon as the water recedes and everything done to reopen the railway as quickly as possible. A number of safety-critical cabinets, which house complex electrical equipment, are currently submerged and will have to rebuilt once it is safe to do so.

RAIL

NEWS INFRASTRUCTURE OPERATIONS RESEARCH HUB PEOPLE JOBS

West Coast Main Line re-opens

08/12/2015 in Network

The West Coast Main Line north of Carlisle has reopened, two days after it was under eight feet of water.

The first train to pass was the 1051 Edinburgh Waverley-London Euston, operated by Virgin Trains, which passed through the affected area just after 1300 today (December 8).

Network Rail engineers worked around the clock to carry out repairs after Storm Desmond caused widespread flooding in the North West.

The water subsided on December 7, and NR has subsequently removed debris and mud from the railway. Repairs to the track and infrastructure have also been completed.

Engineers will remain in place to repair damaged signalling and electrical equipment. Until that is completed speed restrictions will remain in place.

Storm Desmond - West Coast Main Line

Validation – flood narratives

Validation – India EO

- Validation using EO data (range of platforms)
- Visual comparison + random sample
- Contingency tables (hit/miss/false alarm/correct negative)

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Data Assimilation

Opportunities:

- Seek to provide a hybrid modelled-observational system, reducing inherent limitations of each dataset
 - Data fusion
 - Data assimilation
- Integration of observed river levels or flood inundation for real-time calibration of Flood Foresight:
 - Use of open EO imagery (i.e. Sentinel-1). Commercial partners also available (i.e. CosmoSkyMed (CSK) constellation).
 - Evidence of current flood used to 'nudge' model forecasts through modification of levels or localised rarity

Conclusions

- SLs provide rapid predictable method for realtime and forecast flood mapping
- Flood Foresight framework is flexible for including alternative data sources and models
- Combine with asset data to forecast impact and loss across whole portfolio
- Consistent, (trans-)national data. Globally scalable.
- User evaluations and validation in progress

- Seeking validation data (space/time)
- Opportunities for collaboration on DA

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