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A detailed look at the new Global Flood Monitoring (GFM) product

2nd CEMS Global Flood Forecasting and
Monitoring Meeting

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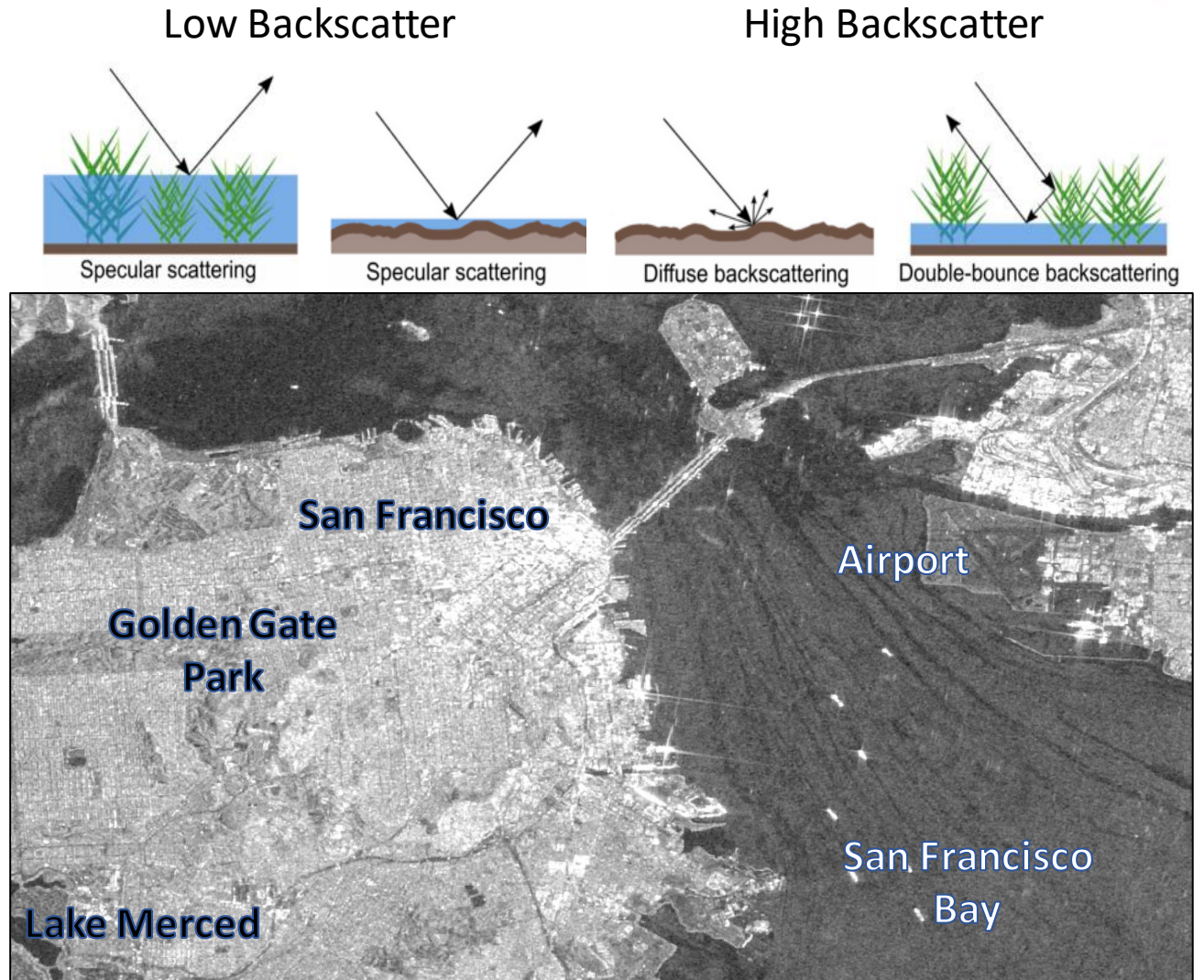


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Principles

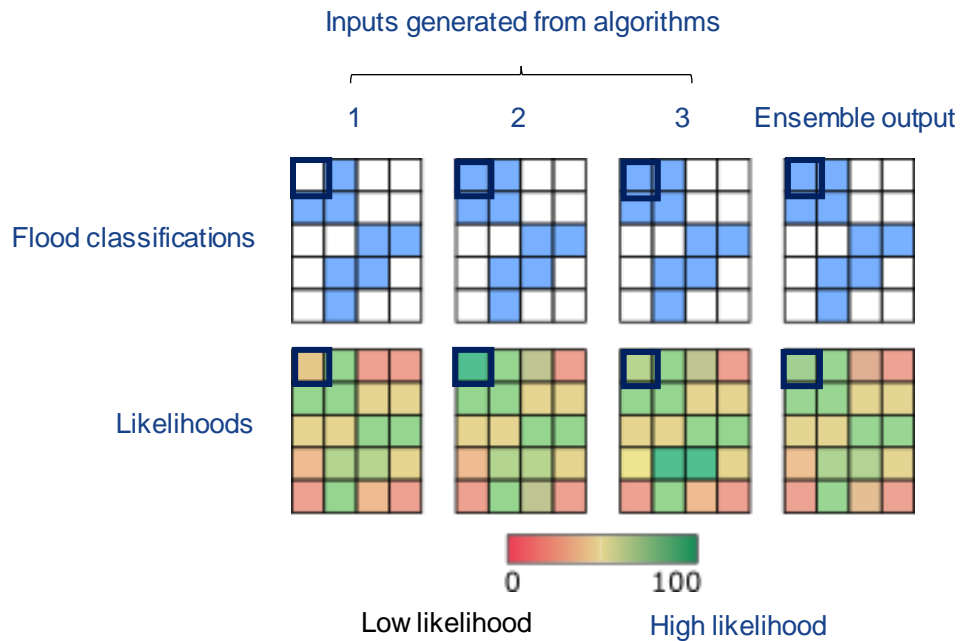
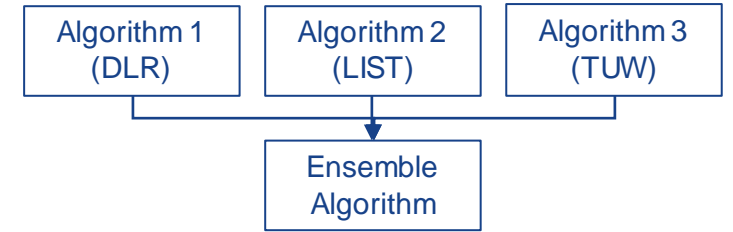
Sentinel-1 & water detection

- Specular scattering over calm water bodies
- Water look-alikes
 - Tarmacs
 - Dry soil
 - Wet snow
 - Agricultural fields
- Rough water surfaces disturb specular scattering
- Double-bounce backscattering in urban areas
- Diffuse backscatter over dense vegetation

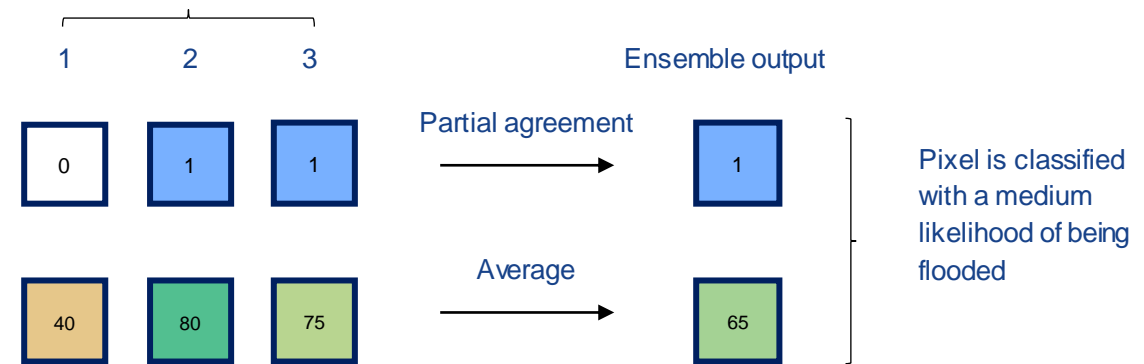


Flood Ensemble

- Combining flood and likelihood results of all three flood algorithms
- Majority vote decides if a pixel is marked as flood or non-flood
- Final likelihood layer is the arithmetic mean of all likelihoods



Example of values from three algorithms over same pixel location in SAR scene





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Product Output Layers

Product Output Layers: Water observations

S-1 observed flood extent

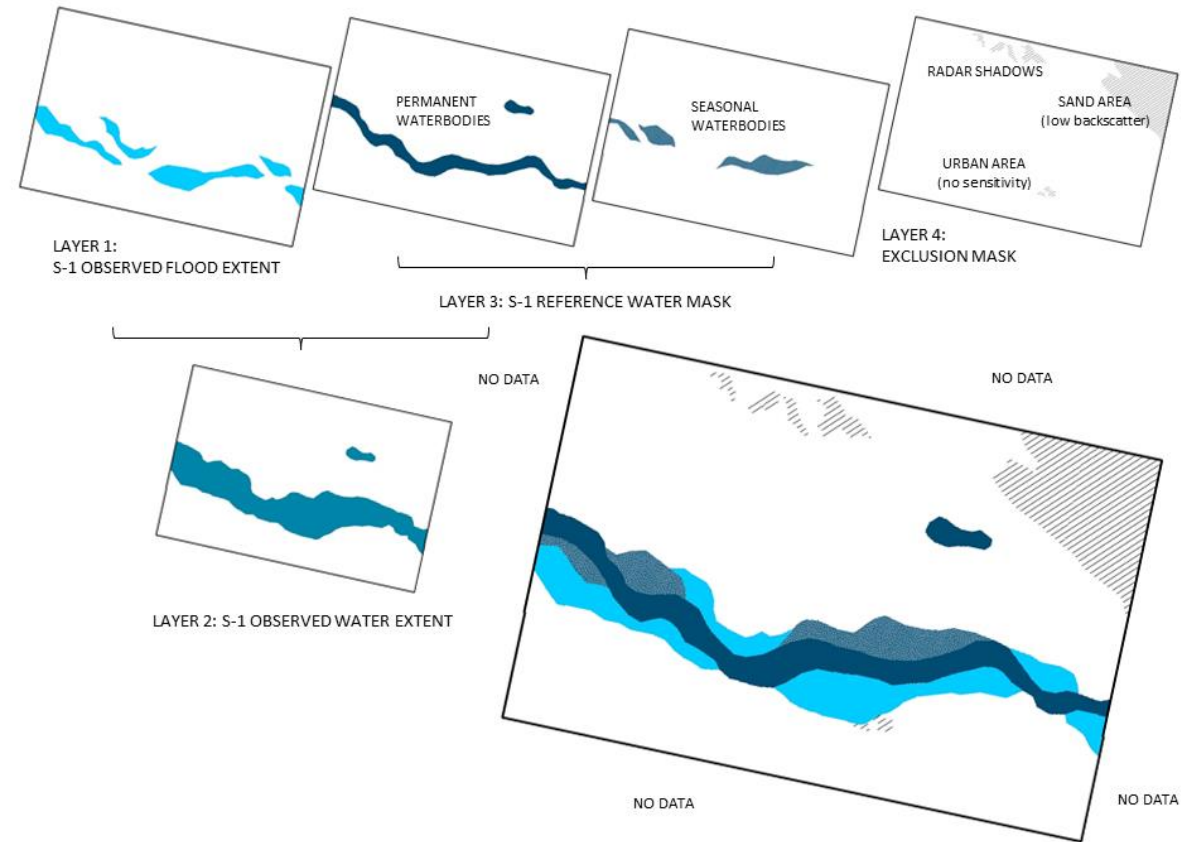
- Ensemble flood extent through flood algorithms by DLR, LIST & TUW

S-1 reference water mask

- Based on water algorithms of DLR & LIST
- Permanent & seasonal water

S-1 observed water extent

- Open water extent as combination of flood extent and reference water



Product Output Layers: Contextual Information

Exclusion mask

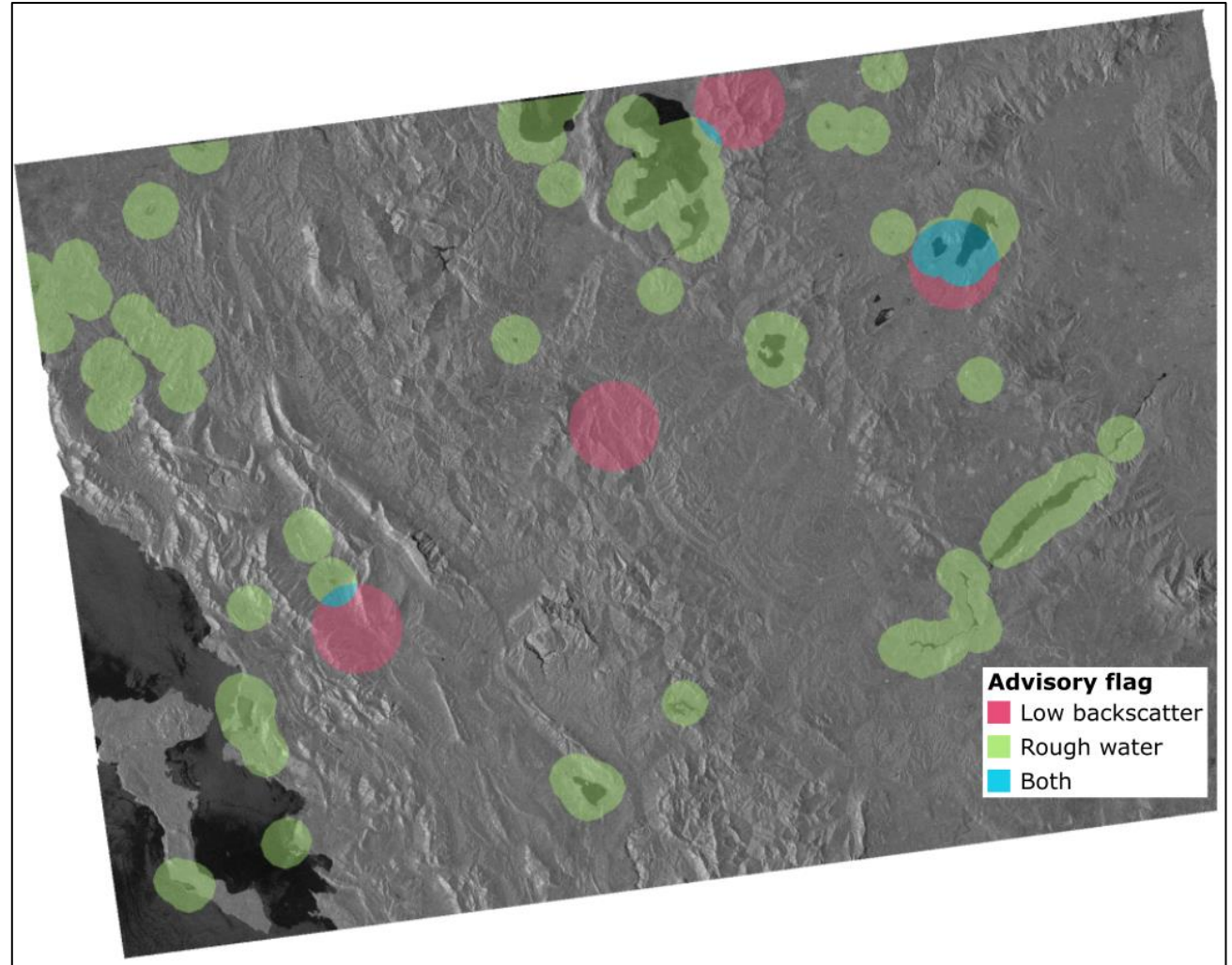
- Exclusion mask where S1 flood delineation is hampered

Likelihood values

- Likelihood values accounting for classification confidence

Advisory flags

- Advisory flags indicating challenging classification circumstances





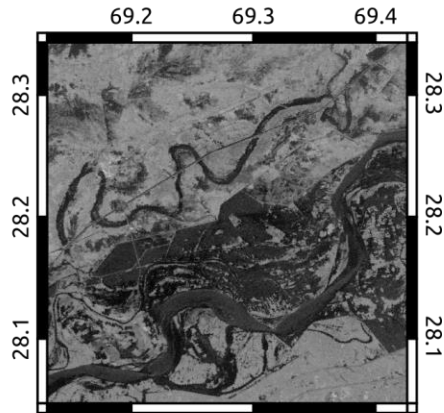
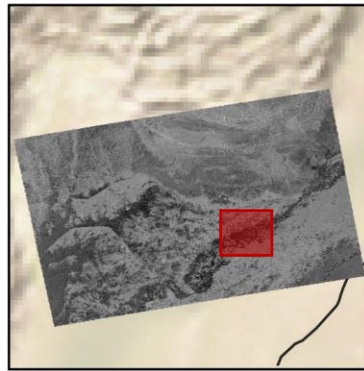
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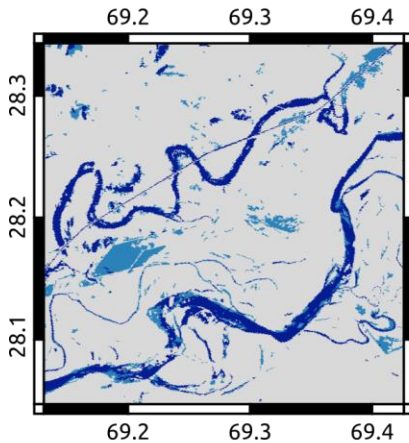
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Results

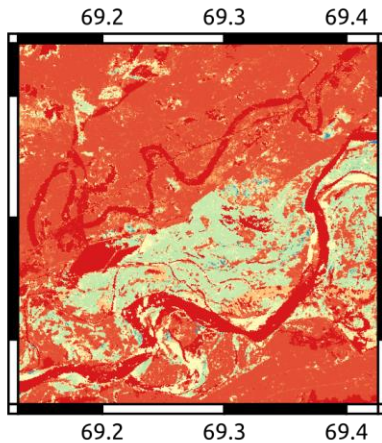
Results



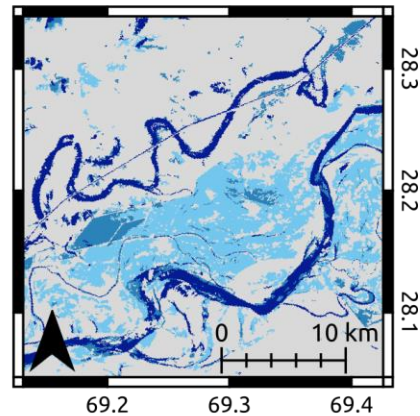
Sentinel 1-A



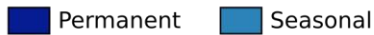
Reference water mask



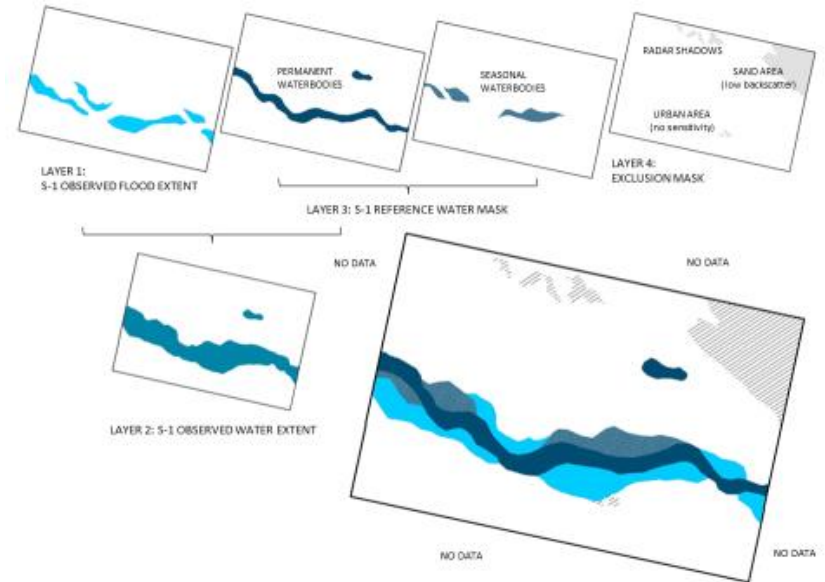
Ensemble likelihood



Ensemble flood



- Flood event in Pakistan September 3, 2022





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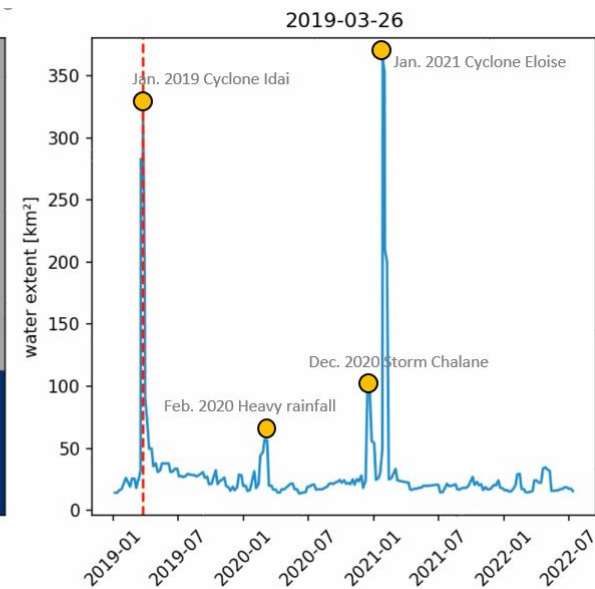
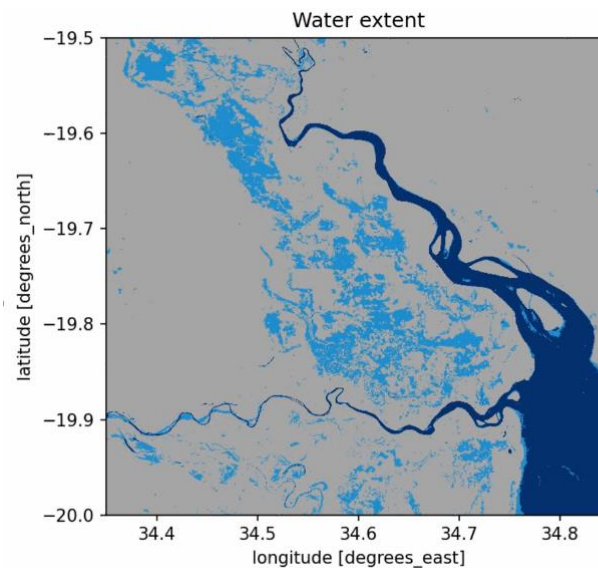
Versioning & evolution

Product Versioning

- Implementation of semantic versioning **Major.Minor.Patch**
- Major version reflects incompatible changes to API and data layers
- Minor version reflects changes in production system but retains backwards compatibility of the data layers
- Patch version reflects backwards compatible bug fixes or changes in the underlying auxiliary datasets used in the system
- Release of version 1.0.0 on December 16, 2021
- Release of version 2.0.0 on January 2, 2023
- <https://extwiki.eodc.eu/GFM/GFMVersioning>
- <https://semver.org/>

Product Evolution

- Update exclusion mask
 - No sensitivity, i.e. refinement of parameters
 - Refinement of Non-water low backscatter over arid areas
 - Radar shadow, i.e. integration of CopDEM simulated radar shadow
- Computing the reference water mask for a period of 5 years
- Flag scenes as flooded with anomaly detection
- Reprocessing of the archive
- Incorporate Sentinel 1-C
- Adding new GHSL



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EVENTS, ONLINE, and MAP VIEWERS



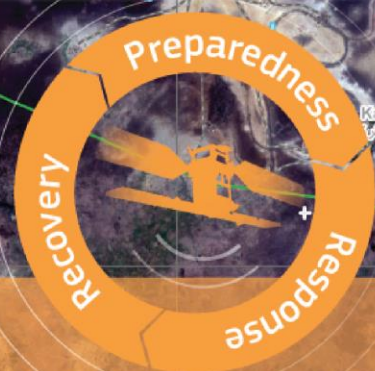
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Rapid Mapping



Risk & Recovery Mapping



Floods



Fires



Droughts



Population



Built-up areas



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