Flash Flood Forecasting

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2. Challenges
3. Opportunities
4. Way Forward

1. Background;

	Angola	Burundi	Congo	Ethiopia	Kenya	Rwanda	Tanzania	Uganda
River Flood	**1**		**1**		**2**	**3**		**2**
Flash floods	**3**	**1**		**2**	**3**	**2**	**2**	**1**
Strong winds		**2**	**3**				**3**	
Hail								
Frost				**3**				
Drought	**2**	**3**		**1**	**1**	**1**	**1**	**3**
Heat			**2**					

Conclusion from SWFDP Technical Planning workshop for Eastern Africa, 2010. Focus on the following severe weather events in order of decreasing priority

1. Heavy rain/flooding and deficit of precipitation/dry spells;
2. Strong winds in relation to thunderstorms;
3. Hazardous Indian Ocean and major lake waves.

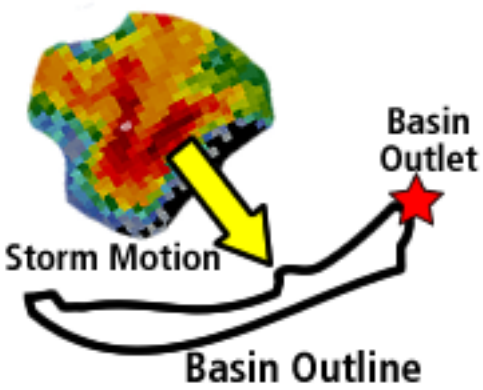
1. Background

- Understand basic hydrology and meteorology forecast ingredients that contribute to flooding
- Identify important Flash Flood ingredients
- User focus. Understand the customer through relationship building, objective setting and ensuring user requirement match capabilities. Delivering flood services for general public, media, and disaster management and civil protection authorities is not easy *(extremely important but out of scope in this presentation)*

1A. Hydrologic Ingredients

1. Size, shape, topography of basin and stream channel
2. Urban Effects
3. Vegetation, soil type, and soil moisture
4. Season

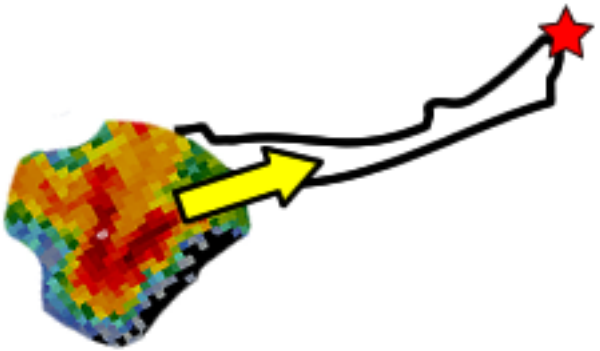
1A. Basin Characteristics: Shape



FF Unlikely

1. Size, **shape**, topography of basin and stream channel

Change storm motion with identical basin



FF Likely

1A. Urban Effects

- Rainfall easily converted to runoff
- Inadequate drainage systems

1A. Soil and Vegetation vs. Flooding

- Soil type important
- Soil moisture, specifically antecedent precipitation increases flooding
- Sparse vegetation increases flooding
- Burn scars should drastically increase flooding

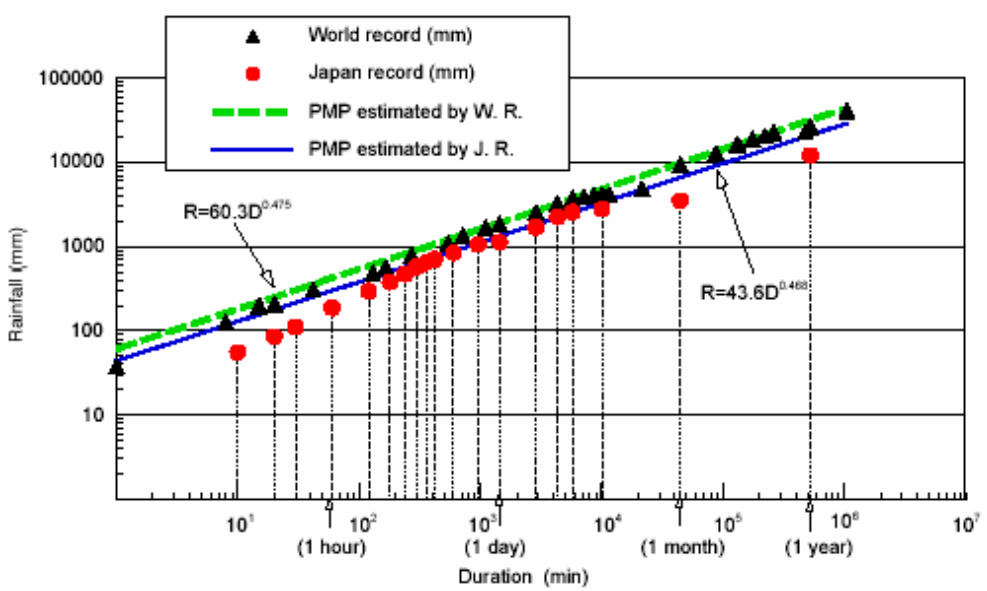
1B. Meteorologic Ingredients

Important insofar as they increase:

- Duration
- Rate*

* Most important

1B. Extreme rainfall events - world



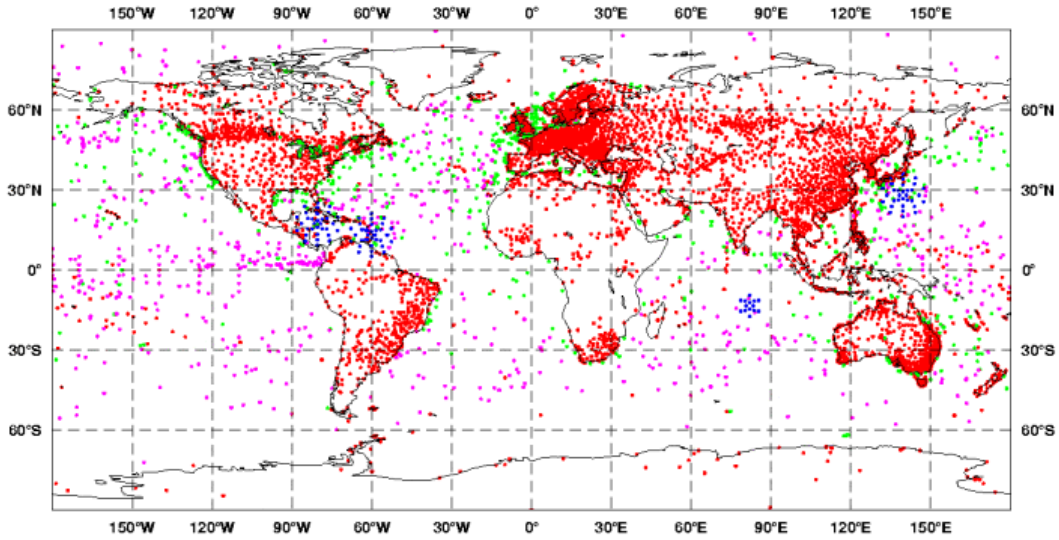
世界および日本の豪雨記録とそれに基づく可能最大降水量(PMP)の推定線［Takara et al. (1996) または水文・水資源ハンドブック(1997, p. 230) に記載の図をデータ更新により修正］

1. Ingredients for flash floods

- Favourable hydrologic conditions and juxtapoistion of the rain bearing system with the underlying catchments
- Deep moist convection, especially high precipitable MCS, have sufficient rates to cause floods
- Forecast potential for highly efficient precipitation production

2. Challenges

- Poor observation coverage
- Uncertainties in the coupled Hydro-meteorological model system
- Verification
- Communication and warnings to end users (false alarms)



2. Challenges: Predictability and Scale

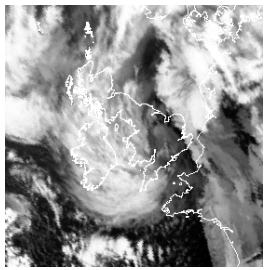
Time for errors to grow longer for large scales

1 Minute

10 Minutes

1 Hour

Increasing scale



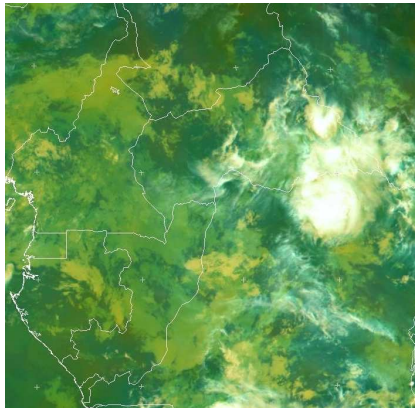
1 Day

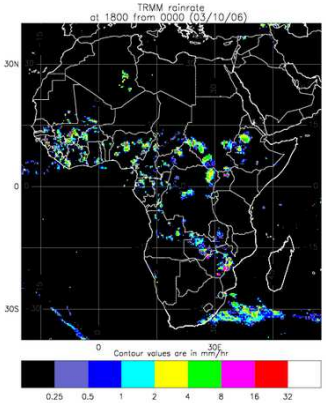
1 Week

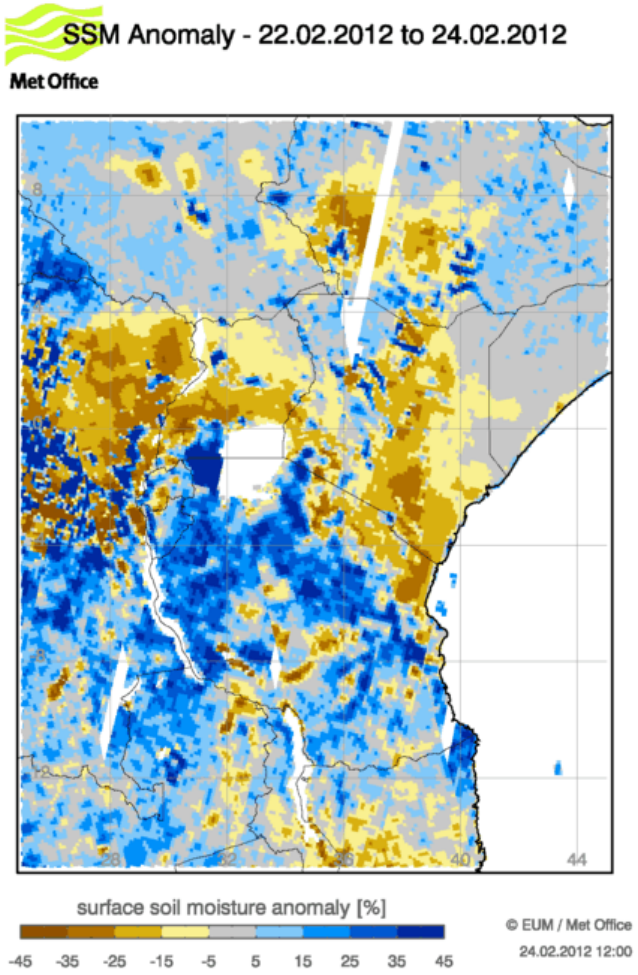
Detailed flow is very difficult to predict at small scale

3. Opportunities: Satellite imagery

- TRMM satellite provides high quality space-based radar, capable of resolving the main precipitation features
- Antecedent conditions can be estimated using ASCAT and other space-based soil moisture estimates
- Post processing satellite imagery to support forecaster decision making

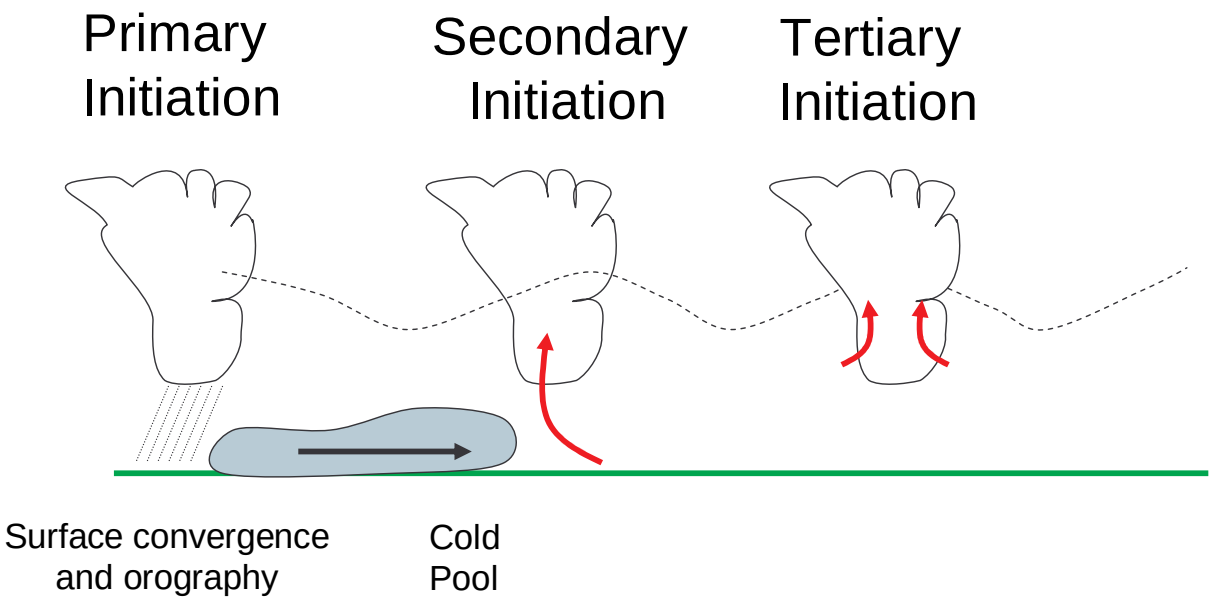






3. Opportunities: conceptual models

Forward propagation



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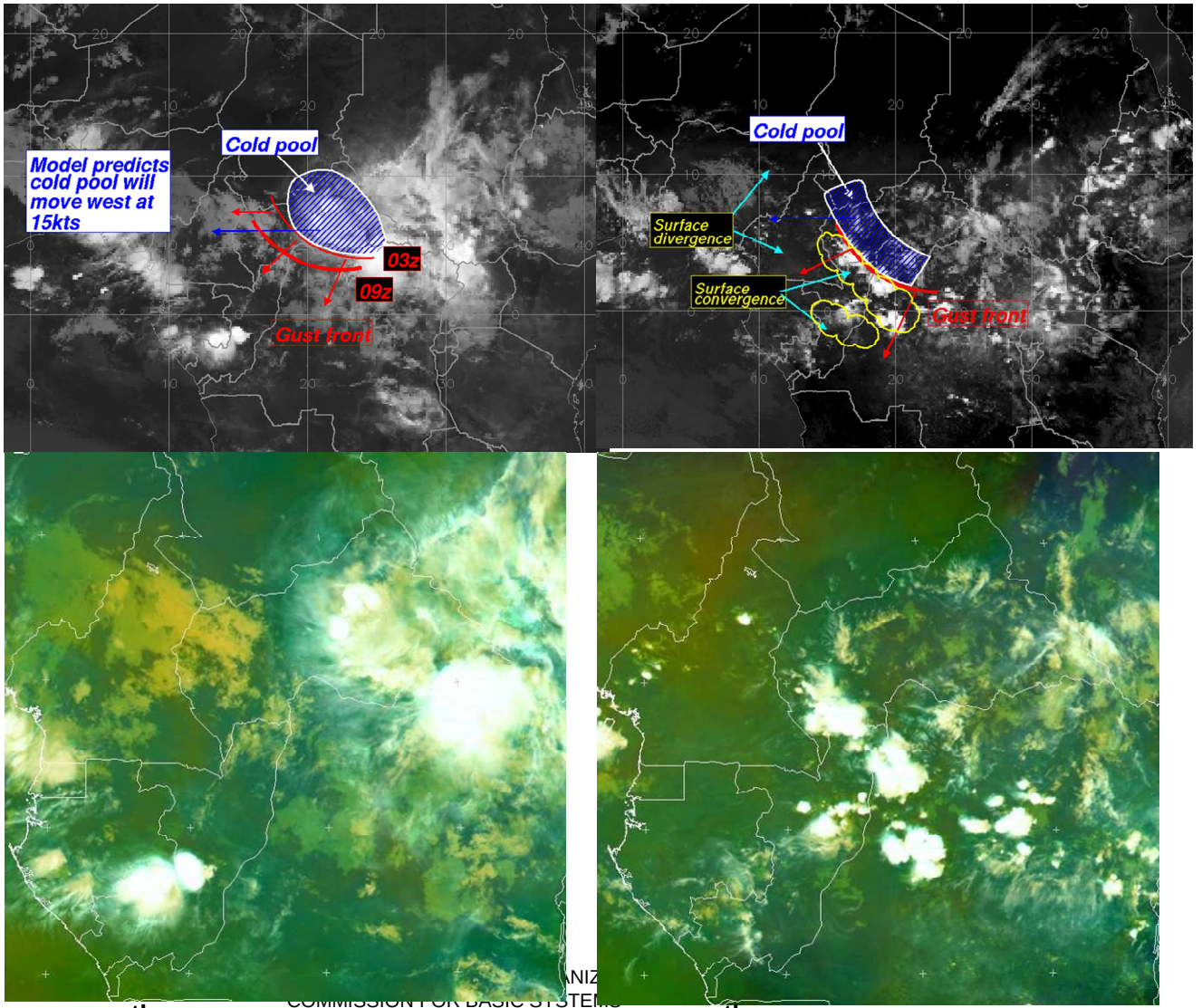
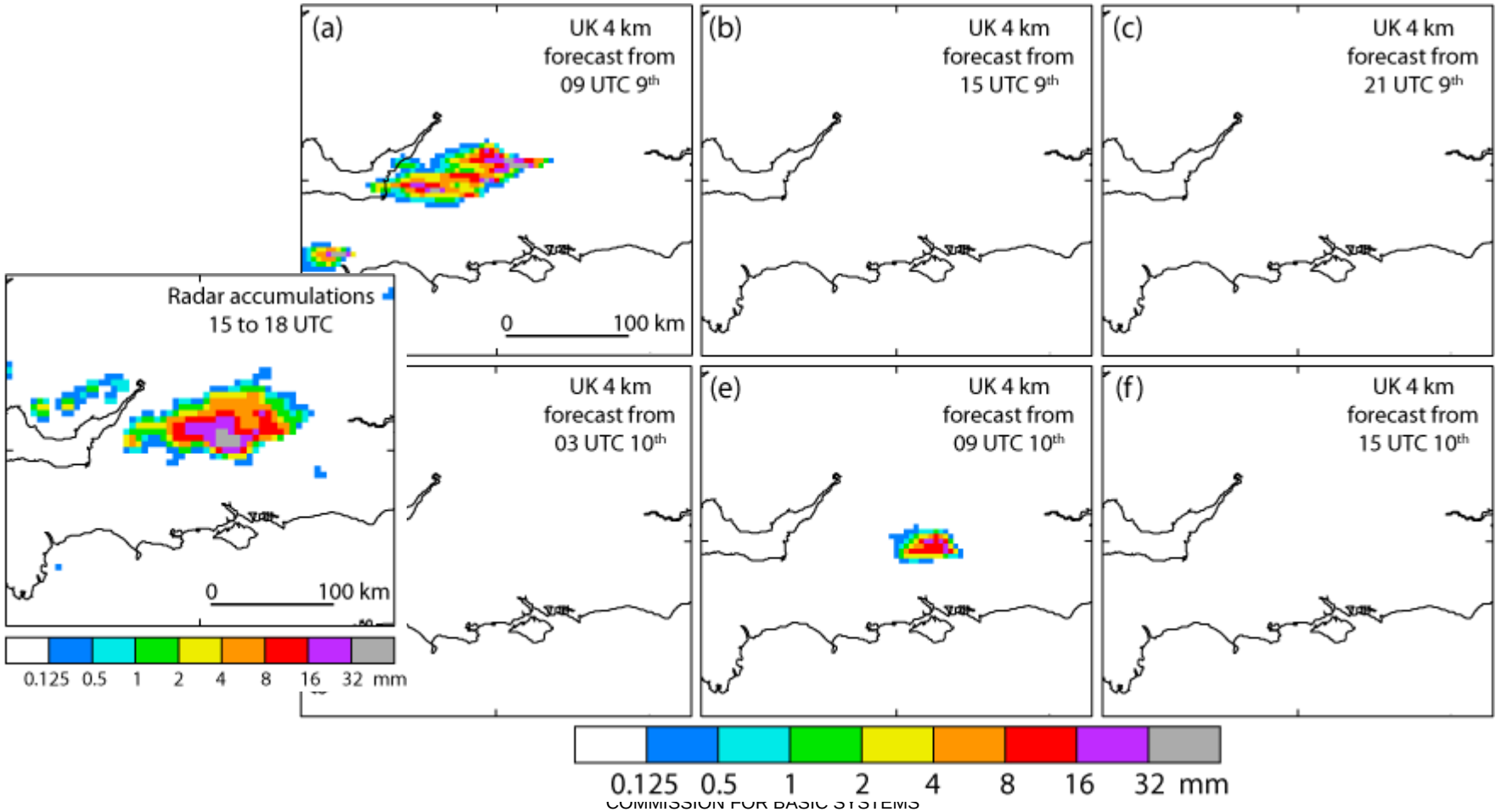


00z, 30th September 2008 **12z, 30th September 2008**

3. Opportunities: Post processing ‘tool kit’ ERA



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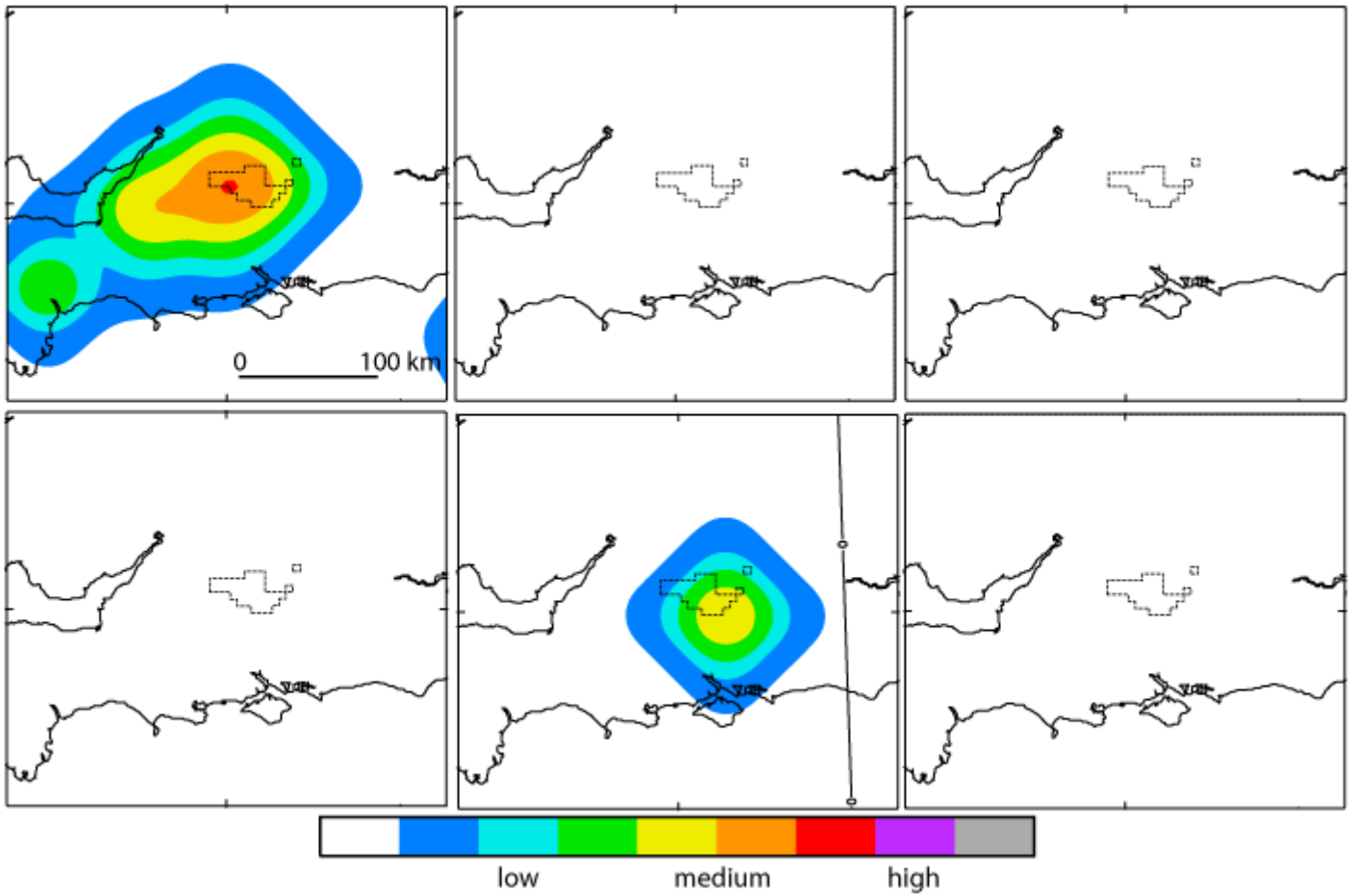

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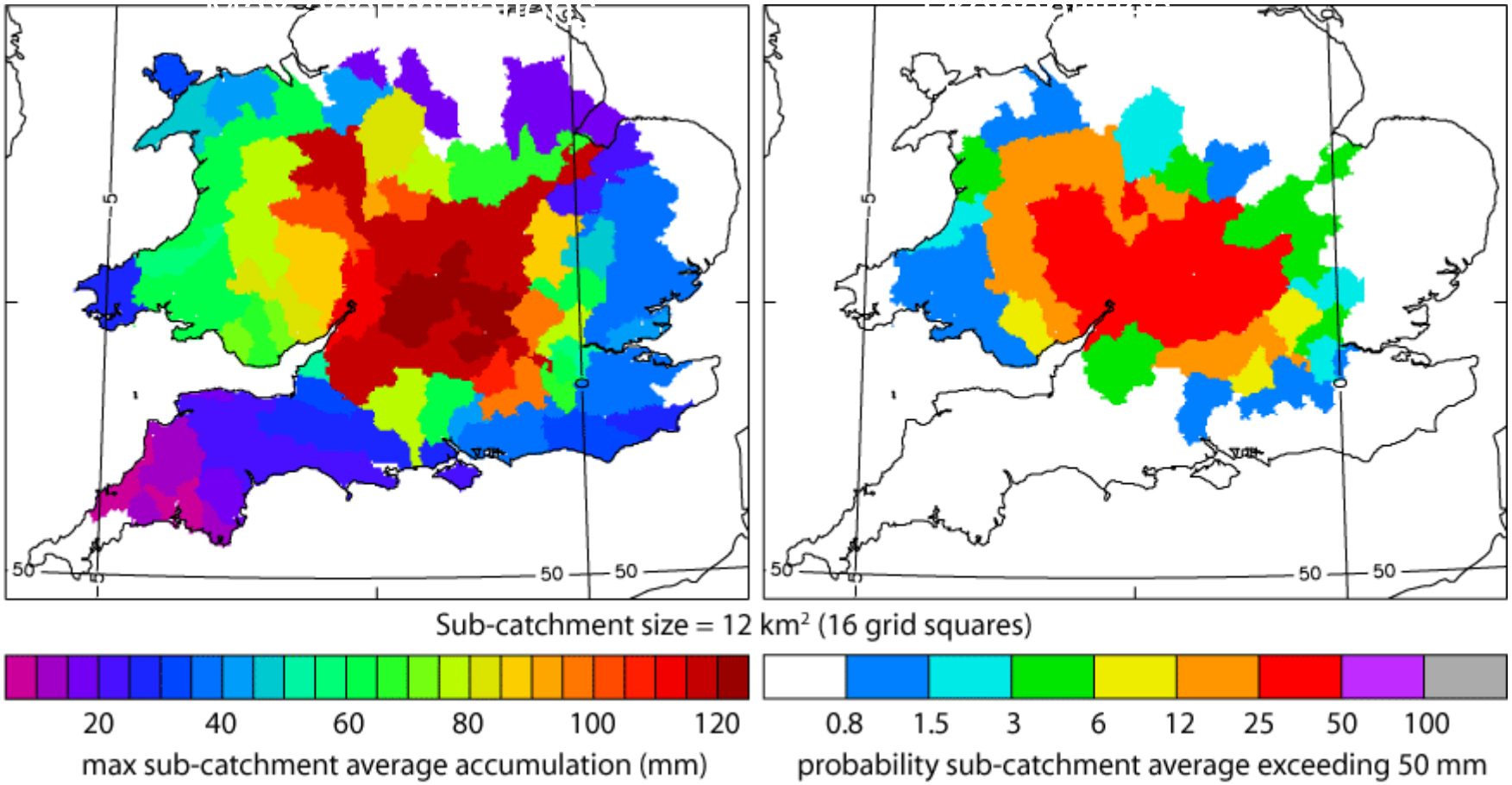

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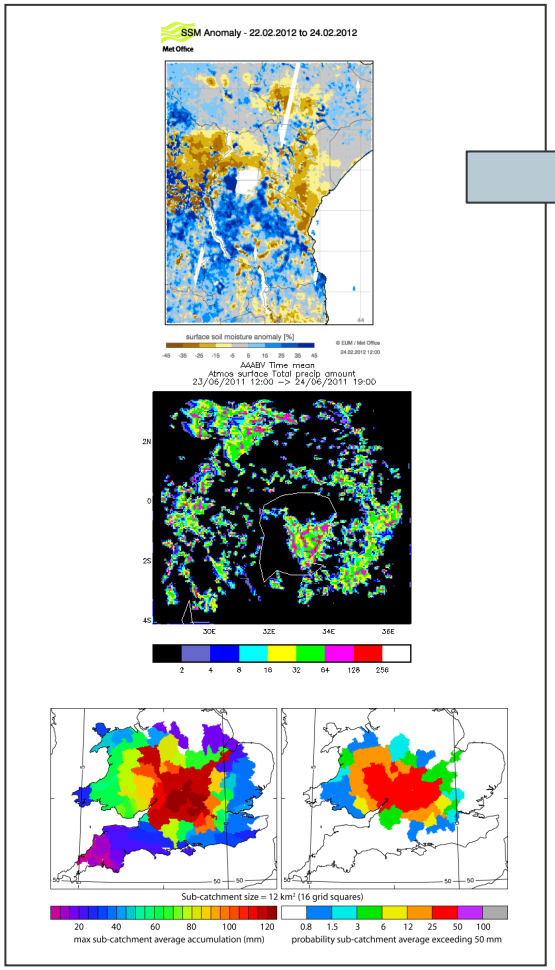
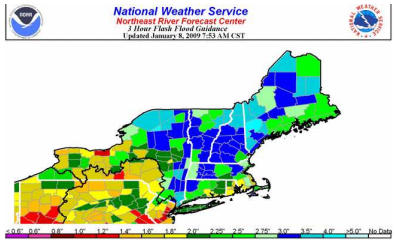
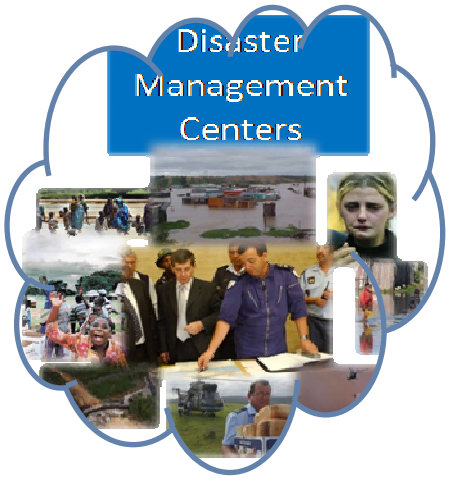


Data required



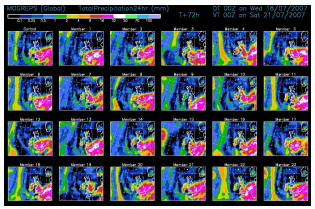
Flash Flood Guidance

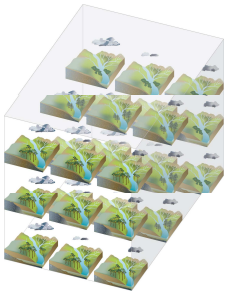
Surface water guidance

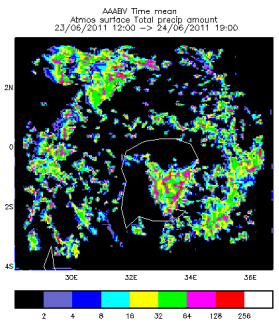


Available to pull from web

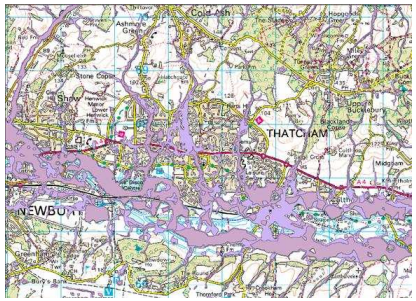
3. Opportunities: Coupled NWP-Hydrologic modelling



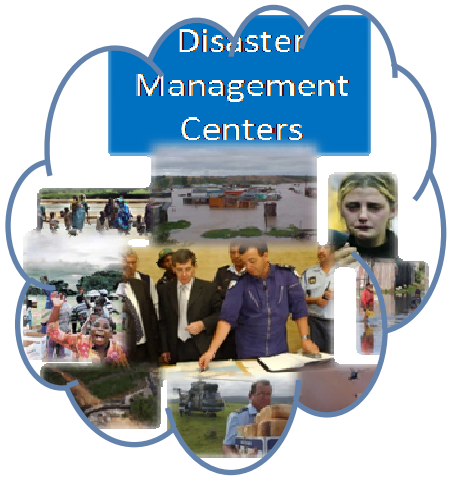




Integrated science and technology



Integrated operations



Integrated advisory service

4. Way forward; Technical

- Training materials on how to find, use and interpret information to deliver flash flood forecasting services should be developed. This will be tuned to particular regions, cover hydrological and meteorological ingredients checklists, conceptual models and case studies.
- Make better use of existing flood maps and hydrological data layers in order to define the susceptibility to flash flooding*
- A post-processing “tool-kit” should be developed, which could be implemented (in whole or in part) by NMHSs. E.g ERA
- Forecasters and hydrologists should work together to develop a holistic approach to flood forecasting using coupled NWP-hydrological models and data sharing systems.

* Hydrometeorological survey of the catchments of lakes Victoria, Kyoga and Albert: Burundi, Egypt, Kenya, Rwanda, Sudan, United Republic of Tanzania and Uganda. Vol.1 Meteorology and hydrology of the basin is available for use and could be a powerful tool to complement flash flood forecasting systems, such as the FFGS.

4. Way forward; User community

- Identification of the users to be served or engaged and determination of their requirements through applying different methods;
- Understanding the user community;
- Understanding how Flash Flooding information is used in decision making;
- Ensuring that NMHS staff are aware of the user needs;
- Ensuring that users are aware of potential NMHS services, as well as the limitations of delivering Flash Flood Forecasting services.

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