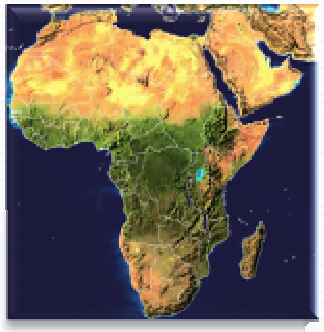
Experiences with space technology in management of 2009 floods in northern Namibia – the user perspective

Hydrological Services Namibia

UN SPIDER Workshop
Disaster Management and Space Technology – From Concepts to Applications
Bonn, Germany, 21-23 October 2009

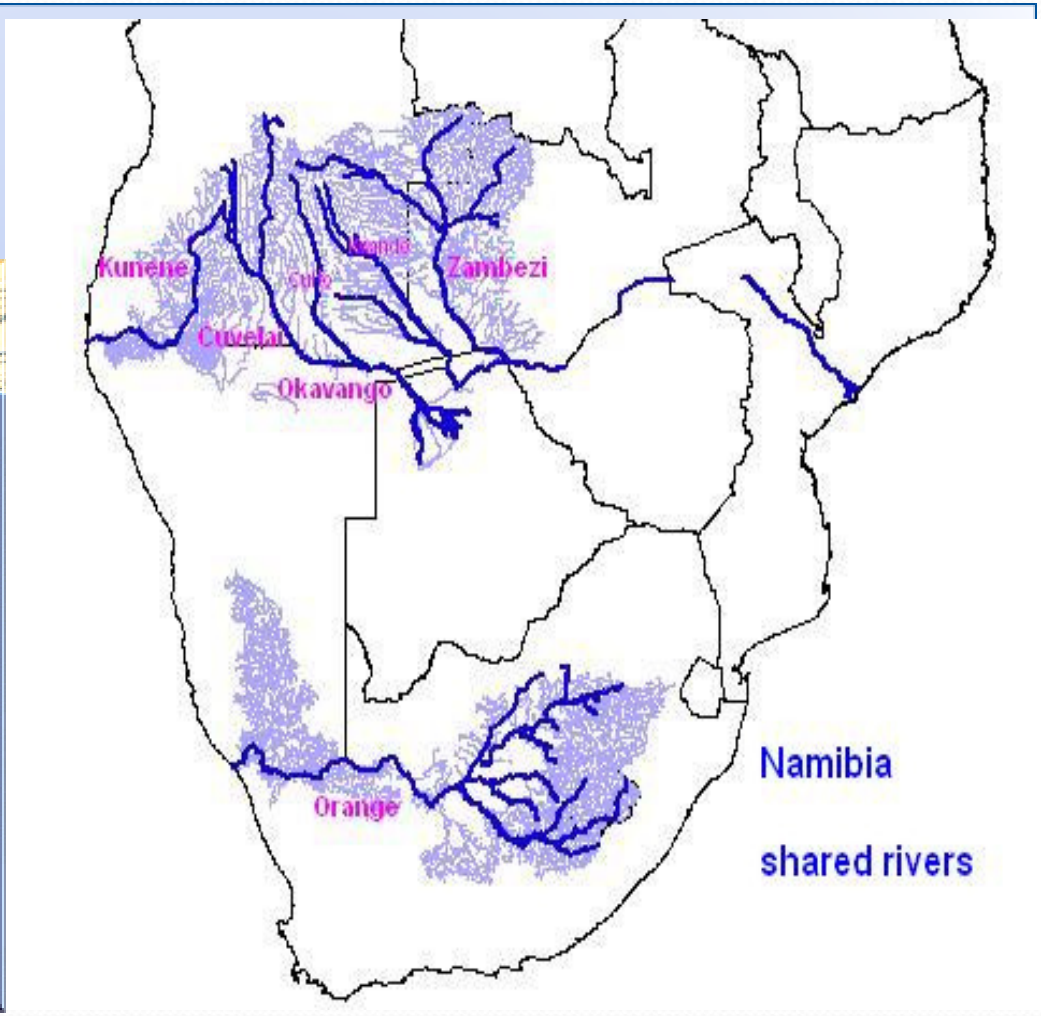
Outline



- Background
- Overview of the flood situation
- Information dissemination
- Space charter activations
- Additional assistance
- Identified opportunities

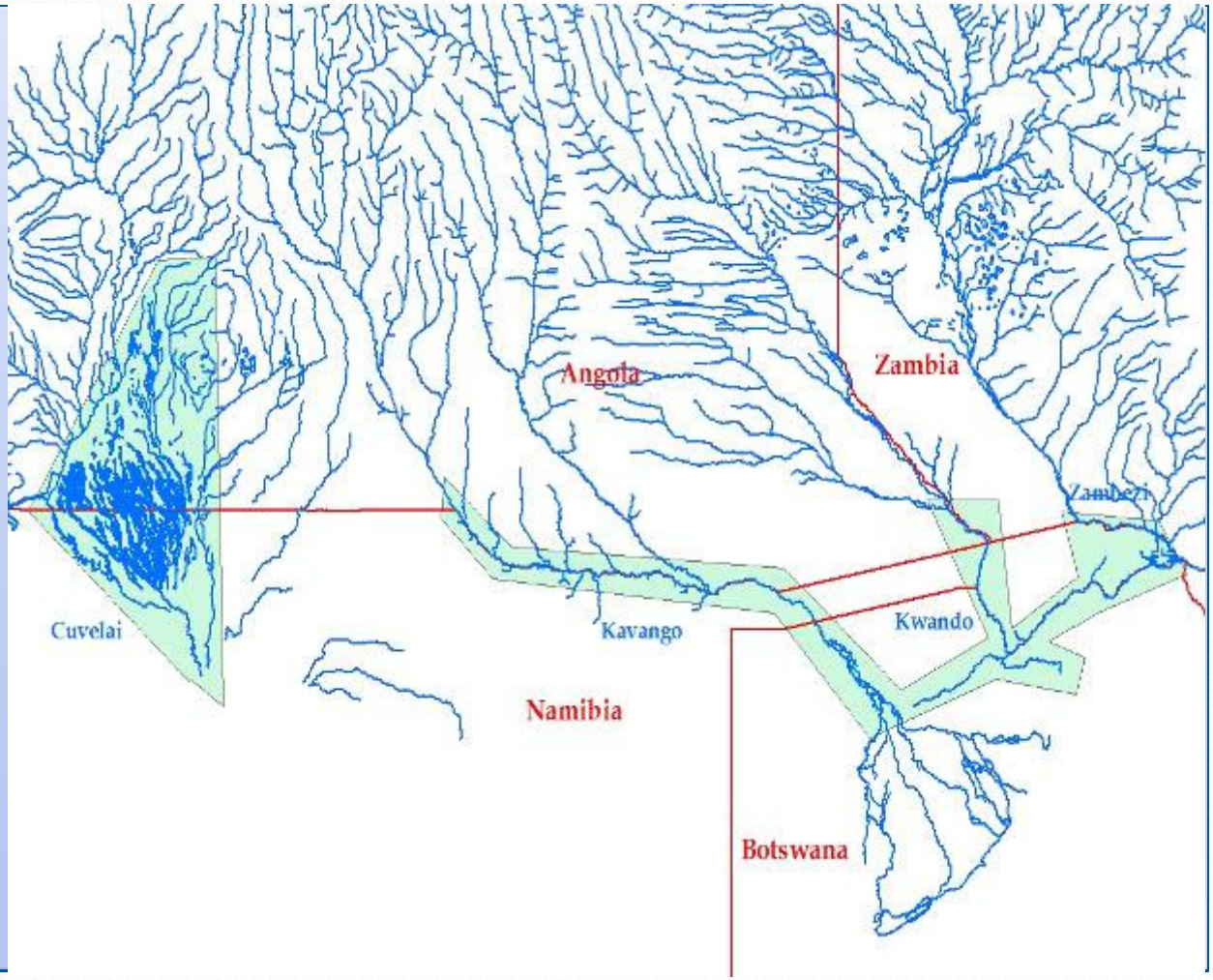
Background

- Geographical position



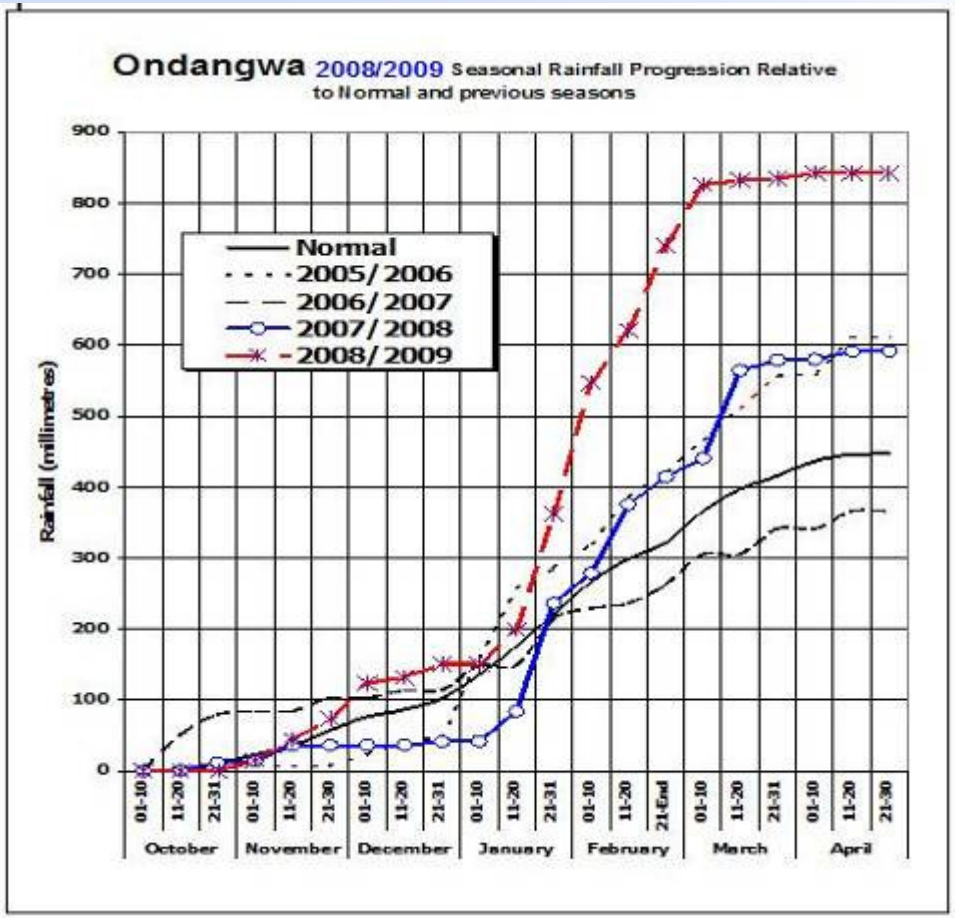
2009 floods timing

- Areas affected by floods in 2009
  - Feb-Mar: Cuvelai
  - Mar: Kavango
  - Apr-May: Zambezi
  - Jun-Aug: Kwando



2009 flood situation

- Record rainfalls in Namibia and in headwaters north of border
- Exceptional floods
  - Cuvelai:
    highest in living memory
  - Kwando:
    highest on record
  - Kavango:
    highest since 1963
  - Zambezi:
    highest since 1969



2009 flood disaster situation

- +/- 60 % of Namibia's population in flood areas
- 56. 1 % (677,542 people) in these areas affected
- 105 lives lost
- 56,945 people displaced – 28,932 in camps
- 93,770 school children affected
- 10,003 livestock lost
- Direct damage: US$ 136.4 million
- Indirect losses: US$ 78.2 million
- Recovery for future mitigation: US $460 million

2009 flood information dissemination

- Information sources:
  - Telemetry data
  - Satellite rainfall estimates
  - Rapid floodmapping
  - Ground team reports
- Dissemination
  - Critical warnings and daily flood bulletins
  - Internet, hard copies, sms-messages, website
  - To disaster management institutions, to media, to identified affected people

2009 flood warnings and response

- Strengths:
  - Adequate meteorological and hydrological forecasts and monitoring in Namibia
  - Daily flood bulletins
  - Near-real-time floodmapping
- Weaknesses:
  - Inadequate meteorological and hydrological forecasts and monitoring upstream (Angola, Zambia)
  - Ineffective communication systems with disaster management institutions and people on ground
  - No flood or hazard mapping available or used

2009 space charter activations

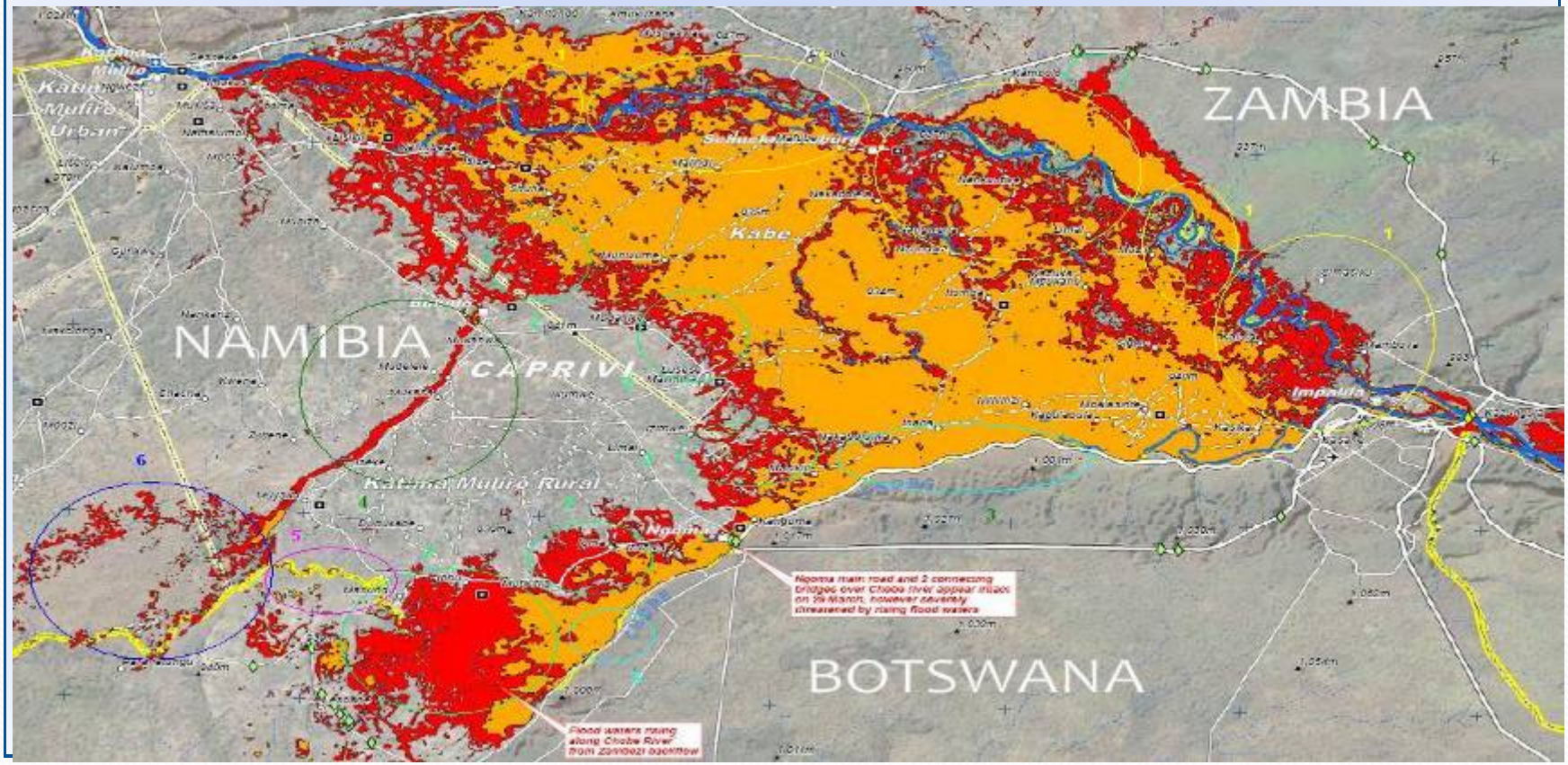
- Charter calls 247 and 249
- Done before in 2008, and in 2009:
  - Better understanding of procedures
  - Better liaison with project managers (DLR, UNOSAT)
- Resulting enhancements in 2009:
  - Charter period timed for conditions of maximum flooding from forecasts
  - Sensor type, area- and time- targeted scenes during charter period
  - Ditto selective extensions
  - Near-real-time processed scenes (one-day-after)
  - Improved products (customized mapping, terrain verification)
- UN Spider and other channels for additional assistance

2009 space charter activations

urban flood mapping

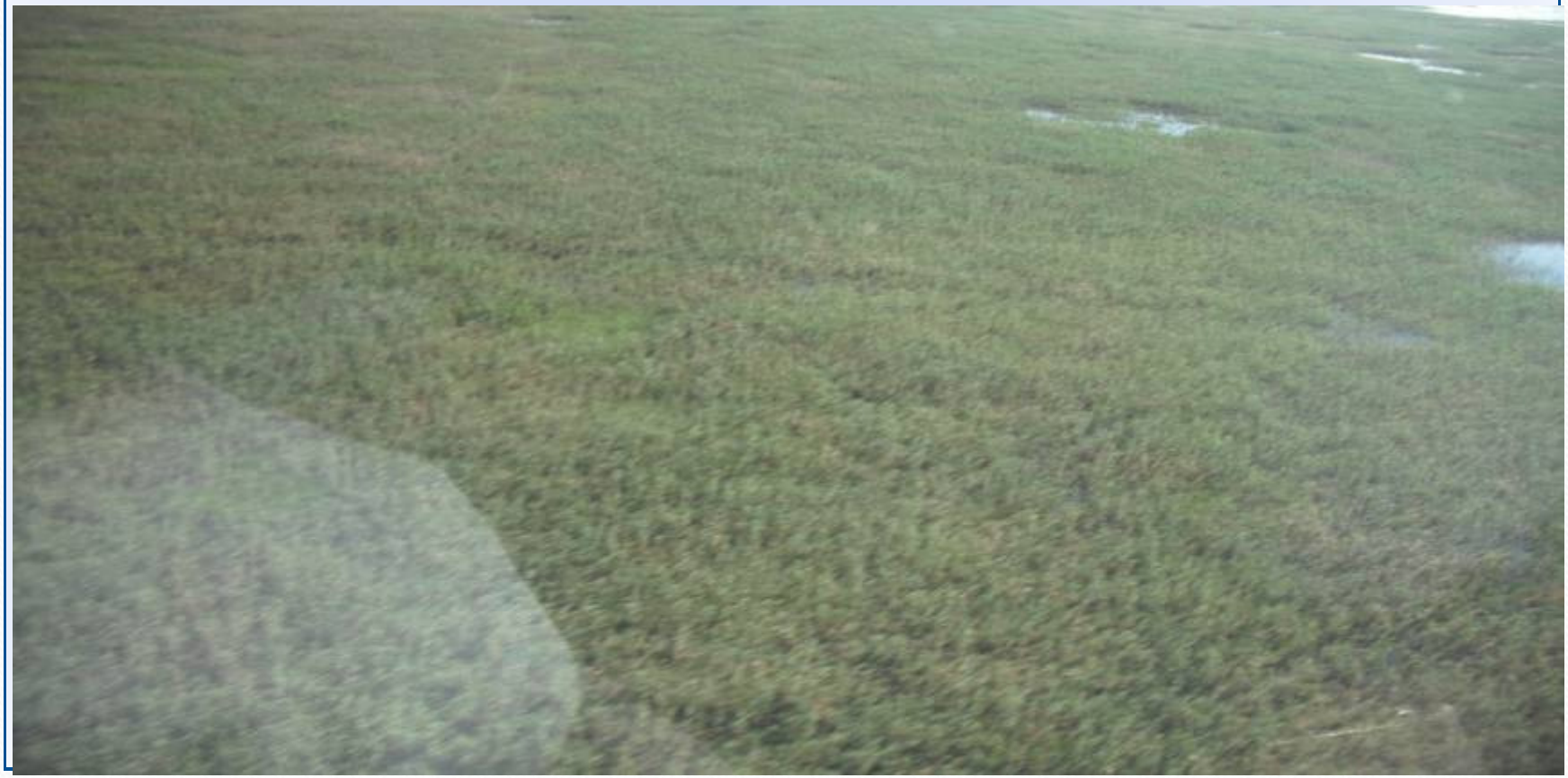
2009 space charter activations

comparative mapping



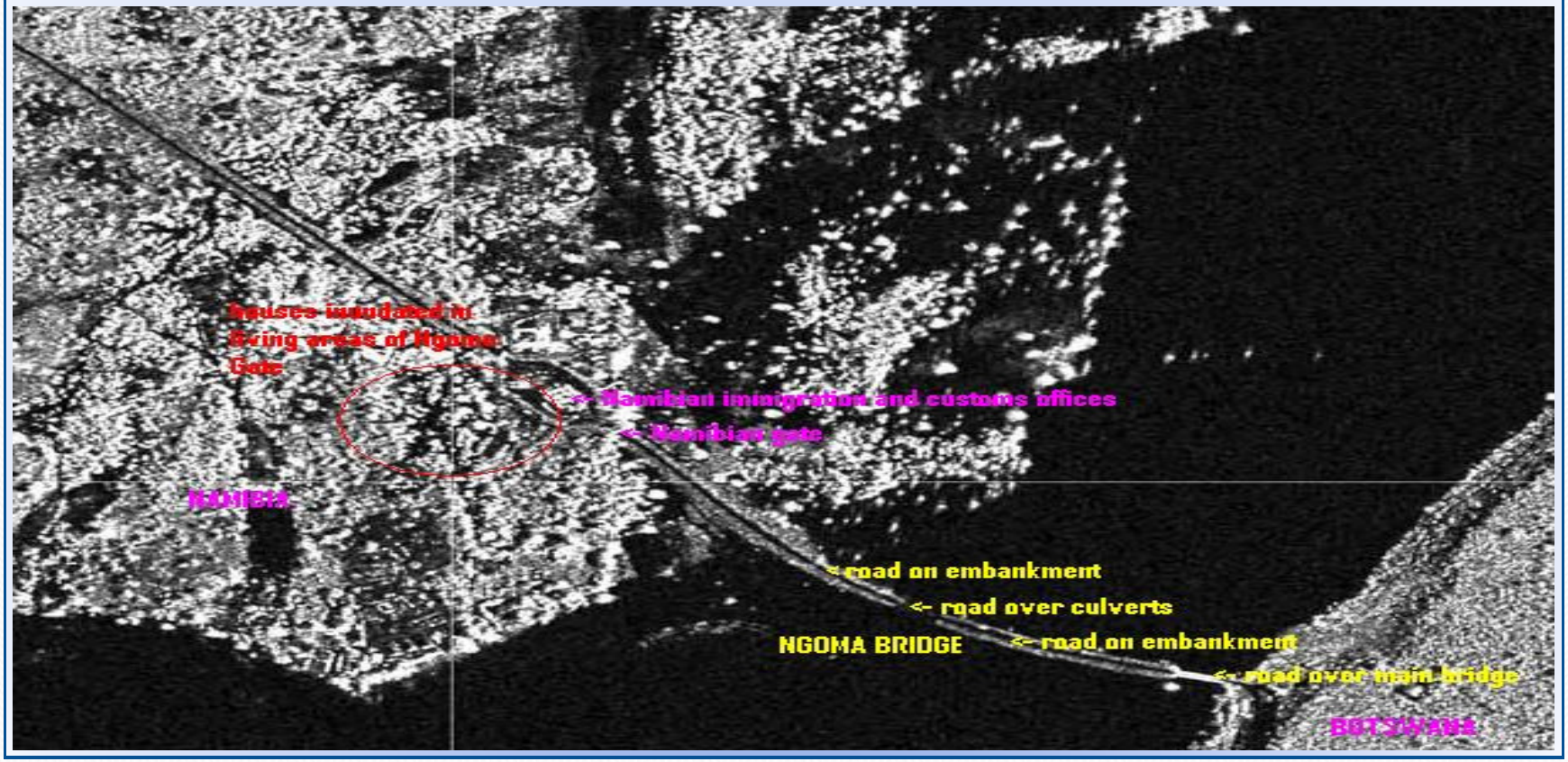
2009 space charter activations

ground verification: inundation of dense vegetation



2009 space charter activations

ground verification: bridges and roads



2009 additional assistance

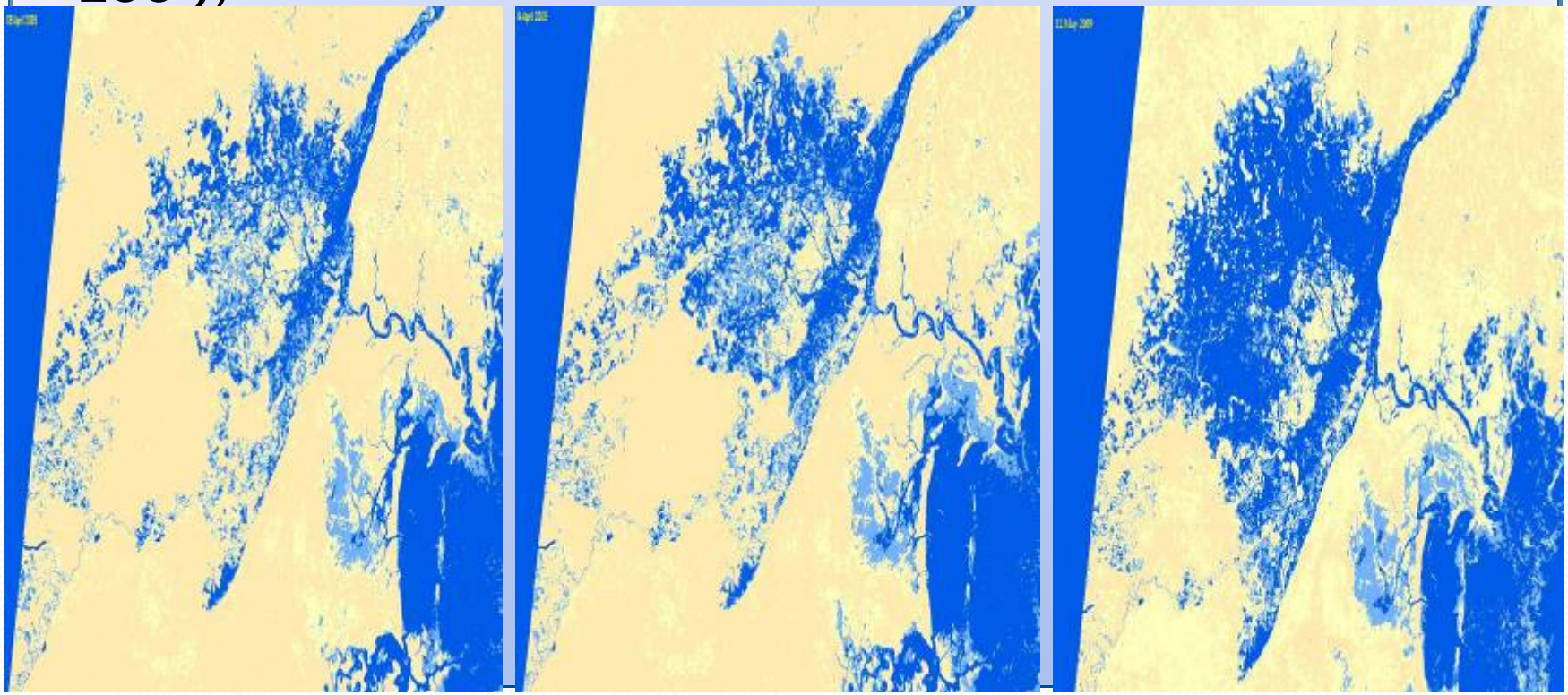
Regular low-resolution mapping first warning of upstream flood development

2009 additional assistance

- Flood management and floodmapping
  - Access to additional scenes
  - Access to scenes after charter period
  - Access to digital images – capacity building
  - Precise monitoring schedules (sensor type, area, time)
- Such as
  - OFDA (Aster)
  - NASA (EO-1)
  - NSPO (FormoSat)
  - CSA (RadarSat)
  - Planet Action (SPOT)
  - UnoSat (QuickBird)

2009 additional assistance

EO-1 - Lake Liambezi area (begin-, mid- end-April 2009)

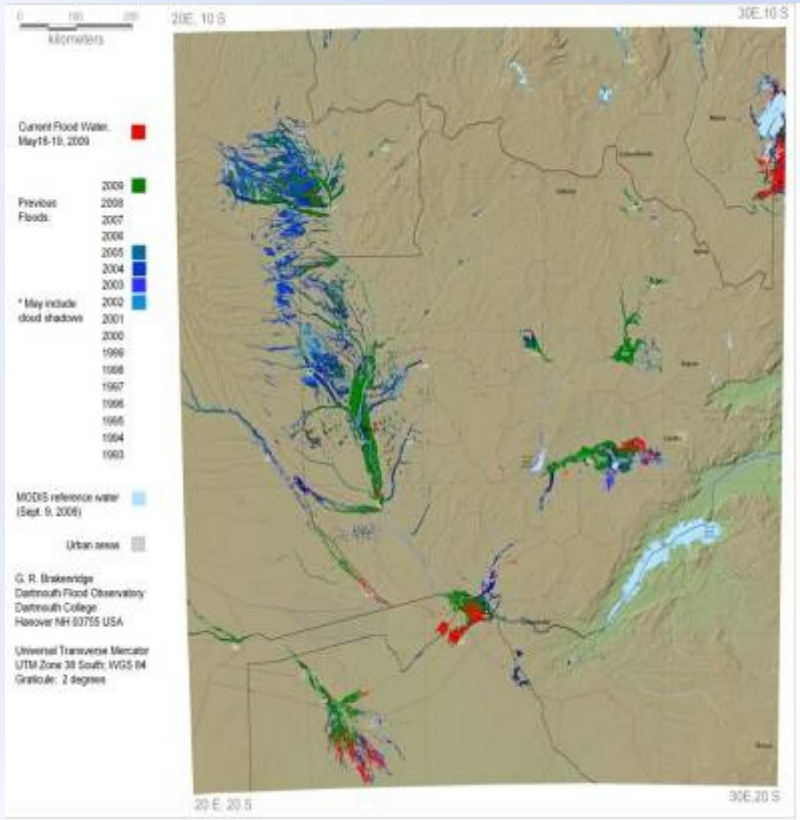


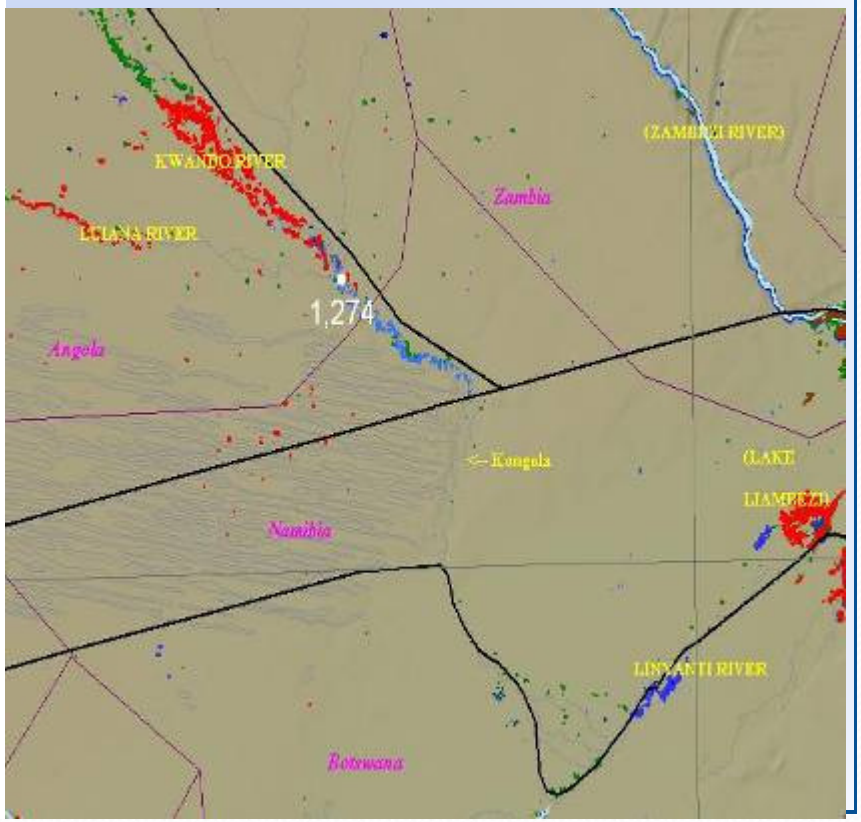
2009 additional assistance

Intensified high-resolution mapping improved management + archive for hazard mapping

2009 additional assistance

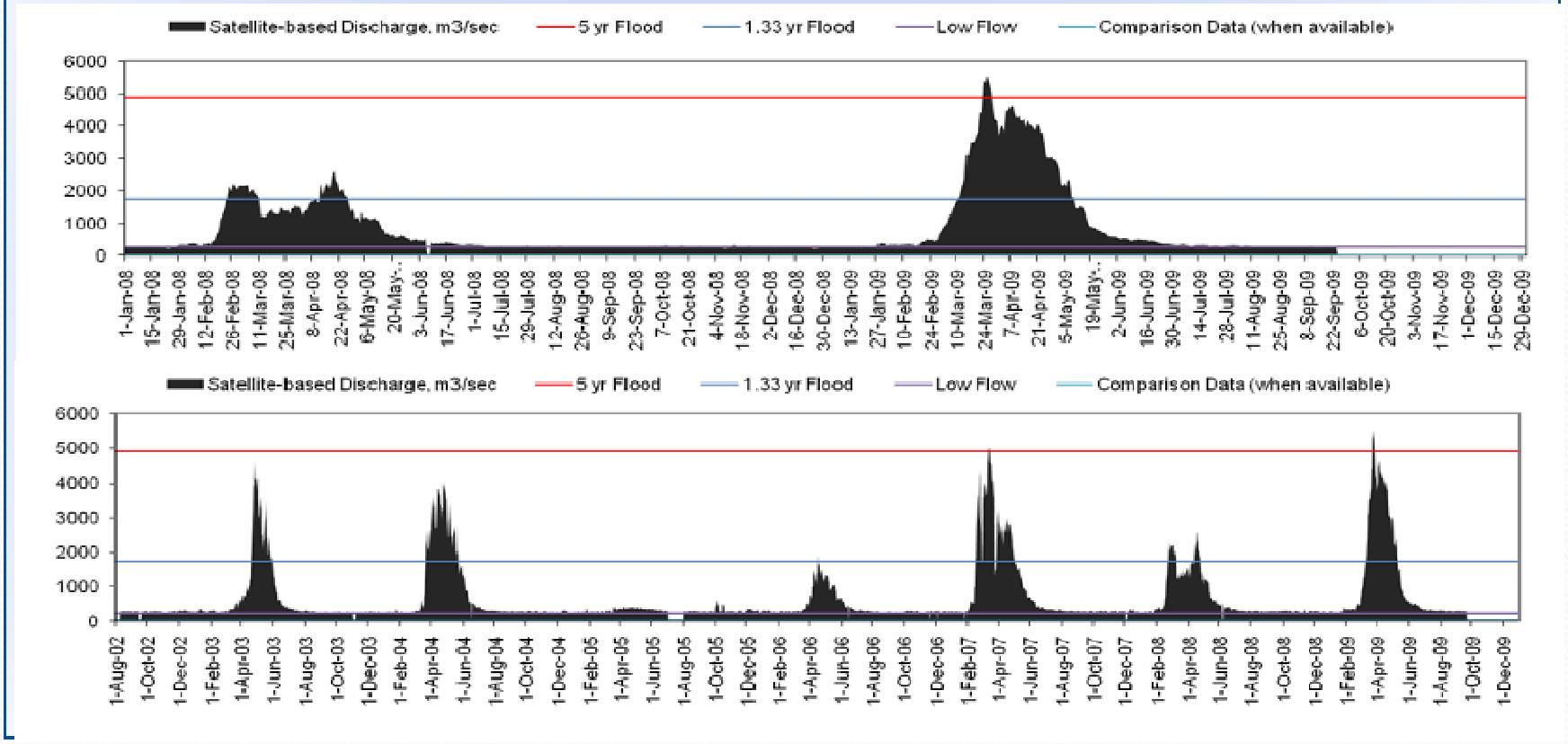
River Watch –early flood warning





2009 additional assistance

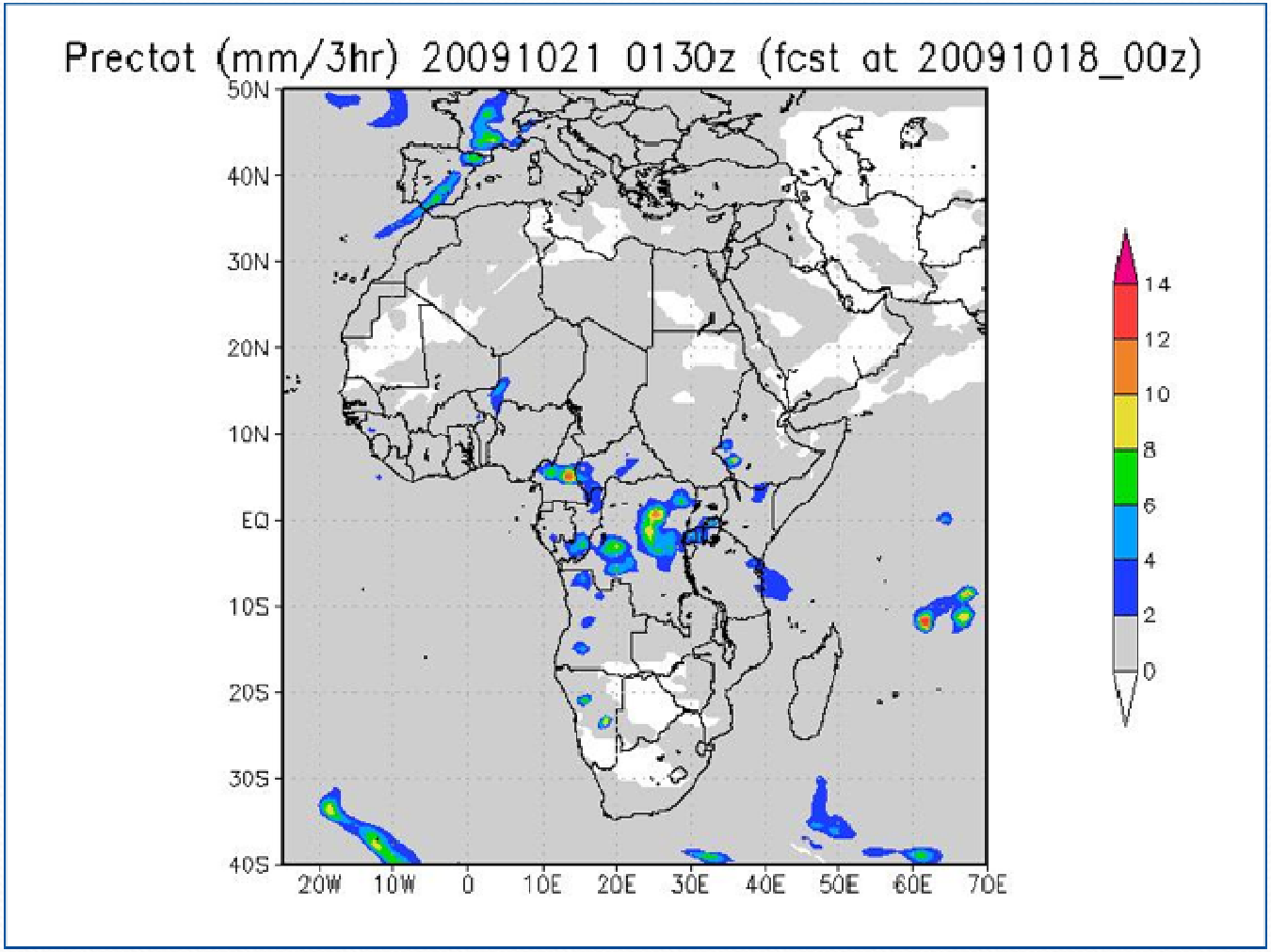
River Watch – early flood warning



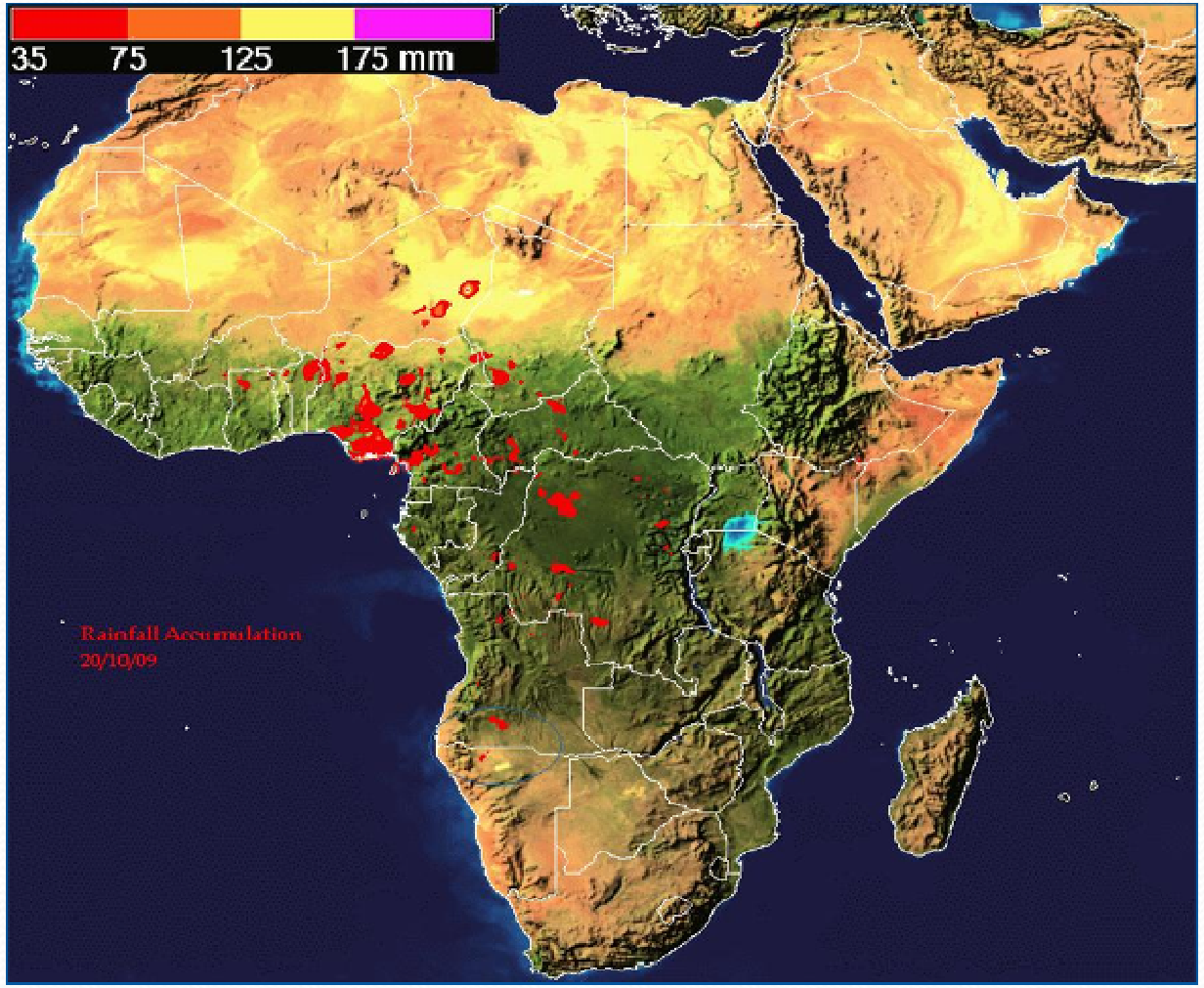
Identified opportunities

- Improve present meteorological warning and monitoring systems available from satellite/internet
- NASA Servir improved early warning
  - Short-term (1-5 days) rainfall predictions for shorter periods (intensities)
  - Near-real-time rainfall estimates ditto
  - Rainfall excess/runoff potential estimates ditto
- Flood modeling (Zambezi)

Identified opportunities



Identified opportunities



Identified opportunities

- Extend floodmapping from space charter activation to operational procedure
- Regular low-resolution scenes early warning
  - Expand MODIS with radar imagery
- Intensified high-resolution scenes flood management and hazard mapping
  - Acquisition scheduling
  - Near-real-time processing
  - Ground validation
  - Funding
  - Capacity building

Identified opportunities

- Customization of River Watch
  - User-defined network
  - Inclusion of critical sites with no/poor monitoring/communication
  - Calibration of sites with monitoring stations
    - Back-up for telemetry stations
    - Near-real time information for non-telemetry stations
  - Link to modeling?

Identified opportunities

- Integrated use of space technologies:
  - Fire hazards
  - Water-borne diseases
  - Drought mapping
  - DTMs
  - Floodzoning – town planning
  - Flood mitigation measures
  - Vulnerability mapping

Identified opportunities

CHALLENGES FOR FLOOD COMMUNICATION

- Communication Centre?
- Institutions/people on ground?
- Information/advice/instructions?
- Is information reaching?
- Is information understood?
- Is appropriate reaction planned?
- Is appropriate reaction executed?
- Availability of floodmapping?