HyMeX

WG3 Report

☞Heavy Precipitation Climatology:

→ ***Long-term rainfall space-time series***

→***100 YR GAUGES***

→ ***50 YR NETWORKS***

→***<30 YR SATELLITE***

→ ***10 YR RADAR***

→***INCL. PRECIP MEASUREMENT OVER MEDITERRANEAN SEA?***

→***Relationship between weather regimes/cyclogeneses and HPEs***

→***Documentation of the space-time structure, nature, organization and life cycle of precipitating systems with respect mediterranean orography and Sea surface characteristics***

☞Factors leading to HPE:

→***Better understanding the role of upper-level dynamics on HPEs***

→**Time horizon – 24 to 72 h – link / complementarity with other projects T-NAWDEX/ THORPEX**

→***Characterization of the low-level mesoscale environment:***

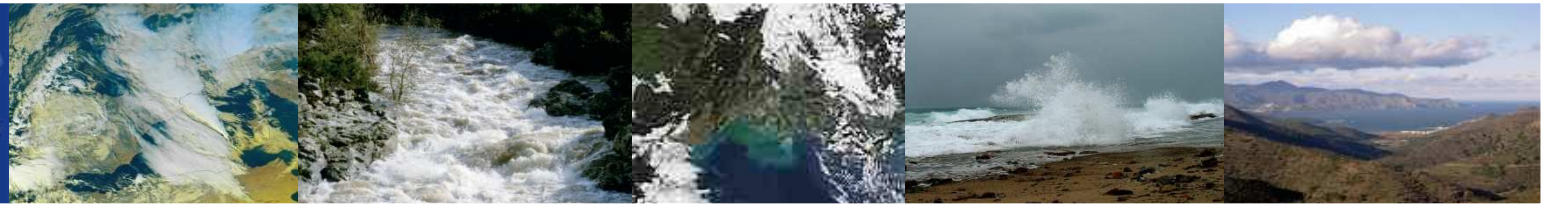
→***Upstream observations over the Mediterranean Sea***

→***Identifying mechanisms leading to high-accumulated surface rainfall***

→ **Understanding the role of the complex orography of the region**

→ **midlevel dry air <-> formation of cold pools**

→**Air-sea fluxes / vertical profiles over sea**



☞ **Origin and Measurements of Moisture :**

→***Moisture monitoring***

→ *3D structure of moisture, together with wind observations (hor. wind; radio sondes; wind profiler; RASS; lidar)*

→ ***Identification of water vapour origin***

☞**Impact of Mediterranean Sea on severe precipitation event:s**

→ ***Impact of the sea surface temperature and thermal heat content on strong atmospheric events (HPE) and cyclogenesis,***

→*Study of the air-sea coupling : simultaneous observations of atmospheric and boundary layers*

→*Validation of surface flux parameterizations*

☞ **Role of aerosols in producing / inhibiting HPE:**

→ ***Role of aerosols as CCN/ICN***

→***Radiative effect of aerosols***

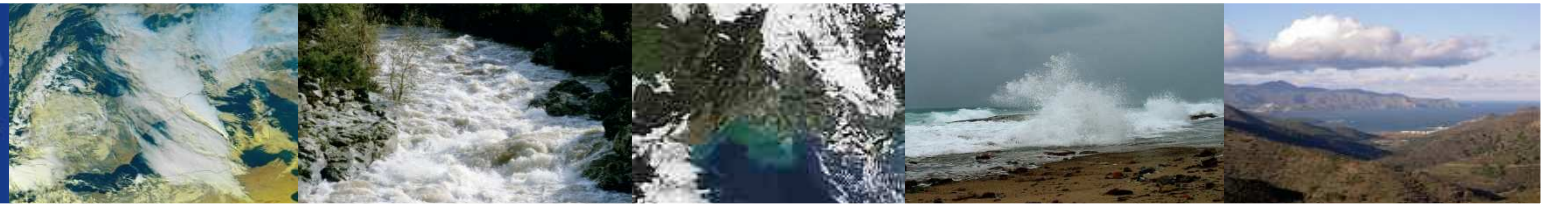
☞**Modelling and Predictability issues (QPF):**

→***What kind of observations do we need to improve physical parameterizations of mesoscale models ?***

→***Mesoscale data assimilation within cloudy and precipitating systems (over the Med. Sea)***

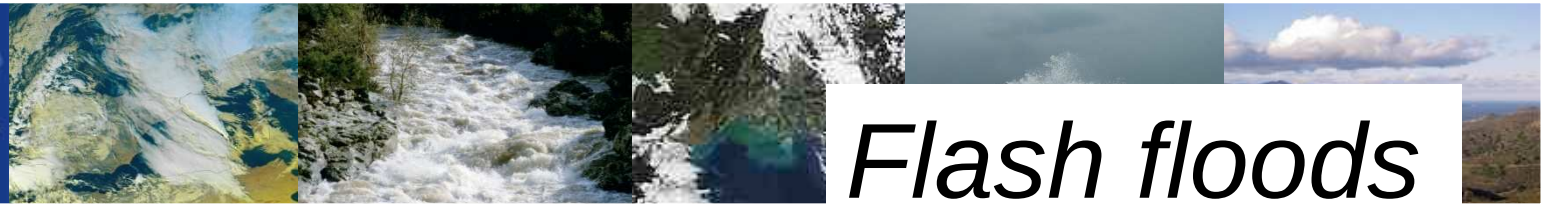
→***Predictability of HPEs + associated uncertainties***

→***QPF at hydrologically relevant space-time scales (perhaps including statistical downscaling***



- **LOP/EOP/SOP strategy**
  - → **SOP : Sept-Oct.-Nov. 2011**
  - → **EOP: 2010- 2013**
  - → **LOP: 2010-2020**

HyMeX



Flash floods

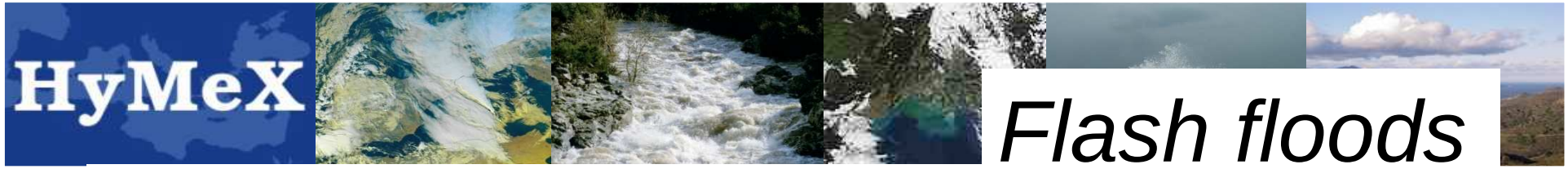
Expected results

Short term FORECASTING of HP and FF

Long term predicting of HP and FF

Assess the impact of the climatic change or anthropic changes

observation and modelling strategies



Flash floods

(data)

→ Hydrometry
→ Historical & Paleo hydrometeorology
→ Regional analysis
→ Post-event analysis
→ Remote sensing techniques for flooding-river characterization
→ Sediment yields and pollutant fluxes in intermittent rivers

(processes)

→ Hydrologic experiments at the hillslope scale
→ Karst and flooding river interactions
→ Initial soil moisture characterization
→ Linking the hydrologic response and the landscape characteristics

(radar rainfall)

→ Quantitative precipitation estimates (QPE) with high spatial and temporal resolution
→ Quantitative precipitation estimates (QPE) errors
→ Nowcasting techniques

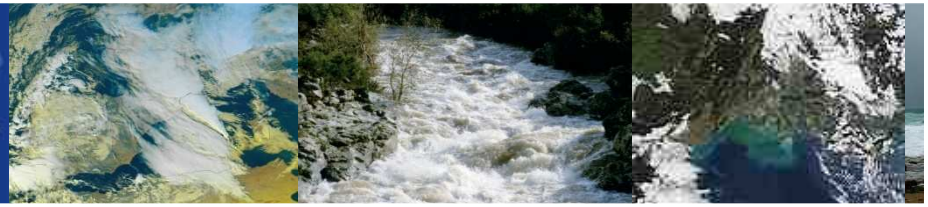
(physical modelling)

→ Test on flash flood processes
→ Scaling effects & aggregative representation
→ Evaluation procedures for quantitative precipitation forecasts (QPF)
→ Use of real-time (QPE) and (QPF)
→ Data assimilation.

(statistical modelling)

→ Extreme rainfall assessment
→ Intercomparison of extreme rainfall and flood distribution assessment
→ Heavy precipitation and flood frequency analysis in a non stationary context
→ Climate change impact on frequency and intensity of heavy precipitation and flash-flood extremes

HyMeX



Flash flood observation

(data collection and data base construction over large range of space-time scales, incl error characterization)

→ Hydrometry
→ Historical & Paleo hydrometeorology
→ Regional analysis
→ Post-event analysis (incl. human)
→ Remote sensing techniques for flooding-river characterization
→ Sediment yields and pollutant fluxes in intermittent rivers

(processes, including infiltration excess)

→ Hydrologic experiments at the hillslope scale
→ Karst and flooding river interactions
→ Initial soil moisture characterization
→ Linking the hydrologic response and the landscape characteristics (incl human aspects)

(multi-sensor rainfall estimation, incl radar)

→ Quantitative precipitation estimates (QPE) with high spatial and temporal resolution
→ Quantitative precipitation estimates (QPE) errors
→ Space-time variation of rainfall microstructure (disdrometer network; polarimetric radar)
→ Nowcasting techniques

HyMeX

Flash floods modelling

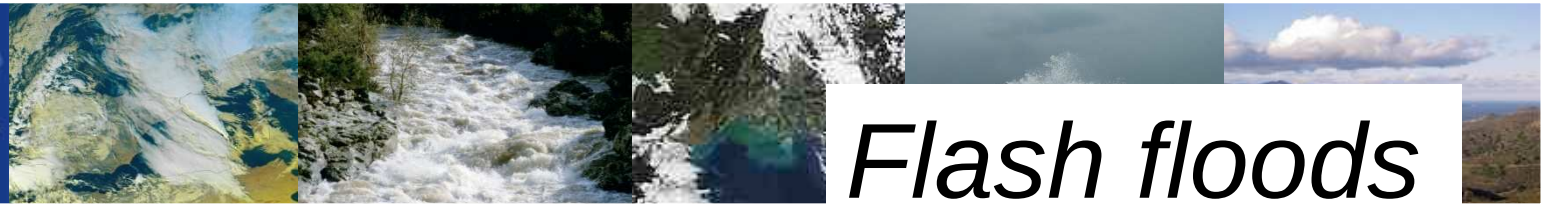
(deterministic hydrological modelling)

→ Develop hydrological models that do not need calibration
→ How to properly validate hydrological models (equifinality problem)
→ Test on flash flood processes
→ Scaling effects & aggregative representation
→ Evaluation procedures for quantitative precipitation forecasts (QPF)
→ Use of real-time (QPE) and (QPF)
→ Data assimilation
→ Climate change impact

(statistical modelling)

→ Extreme rainfall assessment
→ Intercomparison of extreme rainfall and flood distribution assessment
→ Heavy precipitation and flood frequency analysis in a non stationary context
→ Stochastic generation of heavy precipitation (events + fields)
→ Climate change impact on frequency and intensity of heavy precipitation and flash-flood extremes

HyMeX



Flash floods

(Conclusions)

→ Specific aspects of flash flood observation and modelling (e.g. space-time scales concerned; rare but extreme events; short-term forecasting; risk assessment).

→ Common scientific questions with Round Table “Continental Hydrological Cycle”: hillslope processes, landscape characteristics, soil moisture; similar observation and modeling strategies at small scales; impact of climate change.

→ Relatively little attention at this stage to international aspects; efforts will have to be made; existing observatories: OHM-CV, EU-projects (e.g. HYDRATE).

(Perspectives; remaining questions)

→ How can the hydrological working groups organize their HyMeX observation strategy in terms of a SOP / EOP / LOP?

→ Is there a need to reorganize the currently identified hydrological research topics?

→ How can we incorporate the hydrological / flash flood research community in other countries around the Mediterranean arc?