# Summary of the Mini Workshop on FFMP & HMT

NOAA-ESRL, DSRC Boulder, CO
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# Executive Summary

## Part 1: Workshop Summary

**Purpose:**

- We explored the the use of current nationally supported AWIPS hydro applications such as the Flash Flood Monitoring and Prediction (FFMP) tool as a vehicle to rapidly transfer key findings from the Hydrometeorology Testbed (HMT) into NWS operations.

**Workshop Summary:**

- An overview of FFMP was provided, giving the group a sense of:
  - What it is for: a decision support system for flash flood forecasting at very high spatial resolution utilizing the small stream and stream basins (basin definitions developed by NSSL)
  - What it does: FFMP is a client that accepts QPE & QPF gridded fields and compares these to digital or forced flash flood guidance (FFG) provided by the supporting RFC. Color codes by threat level individual basins or counties or grouped basins. Can display trend charts combining QPE and QPF and 1, 3 and 6 hr FFG to determine if FFG will or has been exceeded.
  - How it is used: primarily for issuance of flash-flood warnings, fast response high spatial and temporal decision system but with the functionality to be expanded to other hydro applications
  - FFMP is an interim solution, building towards a coupled-distributed hydro modeling system (CHPS?)
  - FFMP has some GIS-like capabilities
- Mature HMT projects (i.e. transition candidates) were reviewed, including:
  - moisture flux tools for short term orographic QPF ; snow level detection; vertical profile information from S-bands (warm rain processes); improving Z-R selection using profilers/disdrometers; improved QPE through gap-filling radars and improved polarimetric information; Q2; hi-res, deterministic and probabilistic NWP QPF; soil moisture; ALPS
- It was noted that the Monterey WFO's engagement in HMT was the basis for selecting Monterey as one of the first of three early test sites for FFMP

# Executive Summary

## Part 2: Outcomes

**Outcomes:**

- Three primary themes emerged as initial transition topics (with more possible in the future):
  - Atmospheric river guidance- improved forecaster situational awareness
  - QPF fields: hi resolution bias corrected NWP QPF using ground truth data such as Atmospheric River observatory moisture flux tool and ALERT gage data for ingest by FFMP
  - Improved QPE fields (bias corrected)- MPE, Q2, gap filling radars – for ingest by FFMP
  - Longer-term objectives potentially include probablistic QPF; QPE algorithms/ gap-filling radar demos; snow level guidance
- A demonstration supporting both flooding and debris flow applications, based out of the Monterey WFO, was identified
- HMT can help NWS evaluate how to use QPFs in the field through FFMP
  - The incorporation of modeling into FFMP is of strategic import and could have a direct national impact
- A meeting summary (this document)
  - The remainder of this document, describes initial projects ("low hanging fruit"), some potential projects for the long-term, actions, and ideas/questions from the "parking lot"

# First Tier Transition Projects

## "Alpha" Test Projects Identified

Low-hanging fruit for initial transition & demonstration:

- Moisture flux guidance
  - Rain rate exceedance criteria; based on upslope flow and moisture content- Neiman AR amplitude vs rain rate
- Improved short-term QPF forecasts
  - Moisture flux bias correction -Derived from HMT "Flux tool"; data from atmospheric river observatories & hi res models (WRF ensemble)- provide expected value grid and possibly 10% exceedance grid to FFMP
  - Improved, hi-res (5 km) deterministic QPF grid
- Best multisensor QPE for radar bias adjustments- via Q2/MPE

# Second Tier Transition Projects

## "Alpha" Test Projects Identified

Longer-term projects that should be considered and/or planned for

- Projects which will require longer to implement, e.g.
  - requiring modifications to FFMP
  - requiring more development and/or prototyping
- QPF
  - Probablistic guidance
- Radar (QPE)
  - VPR: Vertical Profile of Reflectivity algorithms
  - Guidance for proper Z-R selection during rain event
  - Polarimetric algorithms
- Gap-filling radar demonstration- CASA or NSSL deployed radars
- Snow level guidance grid – for use in NWSRFS
- Implement PARTI: Pacific Atmospheric River Threat Indicator guidance tool – quantify AR during translation to coast and at coast.

Very long-term:

- Support of site-specific hydrologic distributed model run using FFMP best QPE and QPF with soil moisture

# HMT-FFMP "Alpha" Demonstration

Demonstration component of project:

- Part of HMT-West, beginning 2008-2009 (TBD)
- Use and evaluate new and/or improved features in FFMP in the NWS field offices
  - For extreme precip; flash flooding, flooding
  - Debris Flow
- Focused on Monterey WFO
  - With possible engagement by: Oxnard WFO; San Diego WFO; (Eureka WFO, Sac WFO & CN-RFC?)

# Debris Flow*

- A secondary theme emerged during the workshop: the need for results from HMT in general, and the HMT-FFMP project in particular, to support Debris Flow R&D and operations
  - In some ways (e.g. rapid response in burn areas to precip) the challenges are greater
  - ESRL/HMT has responded to an urgent need at Big Sur (where this summer's fires that scorched nearly 200,000 acres in the Santa Lucia Mtns.) by fielding an observatory at Pt. Sur
  - NSSL is expected to deploy a scanning radar to So. Cal. where 40K acres have burned in Nov 2008 on top of earlier fires
  - these efforts should be leveraged and like activities encouraged/supported
- Steve Smith noted that Debris Flow needs stronger representation within and linkages to HMT
- Tom Filiaggi noted that one reason QPF was incorporated into FFMP was due to the results of the Debris Flow Alpha Test. It was found that the response times between the event of precip and actual debris flow could be very short – on the order of 15 minutes
  - "FFMP as it existed without QPF, could not provide much value for such a short response time. If reliable QPF was available, then the FFMP users would be able to get the jump on some of these debris flow events. Unfortunately, the QPF we currently have only comes in as small as a one-hour time frame. I expect it could be very valuable to have a shorter term QPF, for the debris flow phenomena."
  - Given HMT's emphasis on QPF, an approach to shorter term QPF – say half hour QPF – could be most beneficial. Perhaps the WFOs could provide some recommendations on this as a longer-term objective.

*Note: The recent spate of fires in CA, including those actively burning in Santa Barbara and So. Cal. while the workshop was in progress, underscore the urgent need and challenges that WFOs in CA will face in this and future years.

# Actions – Part 1

- Overall FFMP-HMT project oversight:
  - Tim Schneider, Steve Smith
- Technical Leads:
  - Tom Filiaggi will be the OST-MDL 'HMT Person' – FFMP lead
  - Paul Neiman (TBC) will be the flux technical lead
  - Paul Schultz (TBC) will be the QPF technical lead
  - Ken Howard (TBC) will be the QPE bias technical lead
  - Scott O'donnell will be a link to Debris Flow and USGS
- Dave Reynolds will be the POC for the field demonstration aspects
- NB: Given the developmental cycle of FFMP (and AWIPS/2), this is an opportune time to act on these recommendations and we should move quickly to take advantage of these circumstances and engage with Tom Filiaggi as technical lead on FFMP

# Actions – Part 2

- Tim Schneider – with input from others:
  - Complete workshop summary (this document)
  - Draft prior to Nov 16th; Finalize by Nov 18th
  - Needed for meetings/briefings in Silver Spring and Boulder (S. Smith->Don Berchoff; OST-ESRL Meeting; SSD meeting at ESRL) week of Nov 17th.
- Tim Schneider, Steve Smith, Dave Reynolds:
  - Outline/Draft FFMP-HMT project plan: tentatively Nov 21st ; completed Nov 28th
  - Write HMT Implementation Plan – DST/transition sections: tentatively Nov 28th
  - Should include Gannt charts

# Actions – Part 3

- Tom Filiaggi & Paul Neiman coordinate a meeting:
  - With Tim Schneider, Dan Gottas (TBD), Paul Schultz
  - Meet week of 17 Nov to discuss flux and QPF components
  - Should outline a plan of attack to implement, including tasks, dates, deliverables and people
- Tom Filiaggi & Ken Howard coordinate a meeting:
  - With Tim Schneider, MPE person (TBD)
  - Meet week of 17 Nov to discuss QPE bias corrections
  - Should outline a plan of attack to implement, including tasks, dates, deliverables and people
- Tim Schneider coordinate:
  - Follow-on HMT-Debris Flow meeting
  - With Scott O'Donnell, Tom Filiaggi, Steve Smith, Allen White, Dave Kingsmill, Marty ralph, Pedro Restrepo
- A training plan needs to be developed
  - Tim Schneider will work with Tom Filiaggi to develop a training plan.
  - Could possibly engage with Brian Motta
- Project implementation begins 1 Dec (tentative)

# Parking Lot – Part 1

Misc observations, unanswered questions, etc.

- What are the gaps in FFMP?
  - We touched on this question but did not address it explicitly
- How to monitor and track; usage, success, feedback?
- What are the long-term transition process (i.e. beyond the "alpha test")
- We need to document the relevant demonstration & operational requirements
- Are there any lesson's learned in MDL that can help inform this project: e.g.'s of successful transition projects and how they happened?
- What is our verification process for:
  - Floods, flash floods, debris flow?
- Dave Reynolds: How can we get/use point data into FFMP?

# Parking Lot – Part 2

- How will future mandates/changes impact this project? E.g.
  - increasing gridded time resolution to 1 hour
  - Transition to AWIPS-2
- Guardian: we could use the Guardian feature to create an Atmospheric Rivers (AR) box based on PARTI (Pacific Atmospheric River Threat Indicator)
- Paul Schultz raised the issue of "scale transitions" for hydrologic applications (hydrology works on a range of scales)
  - FFMP has built in "drill-down" capabilities, but how do we develop tools that plug into FFMP
- We should factor FFMP into plans for a Gap-filling radar demonstration in HMT-West for 2010
  - This could mean deploying assets outside of the ARB
  - Needs coordination through HMT Advisory Panel

# Participants

13 November 2008**

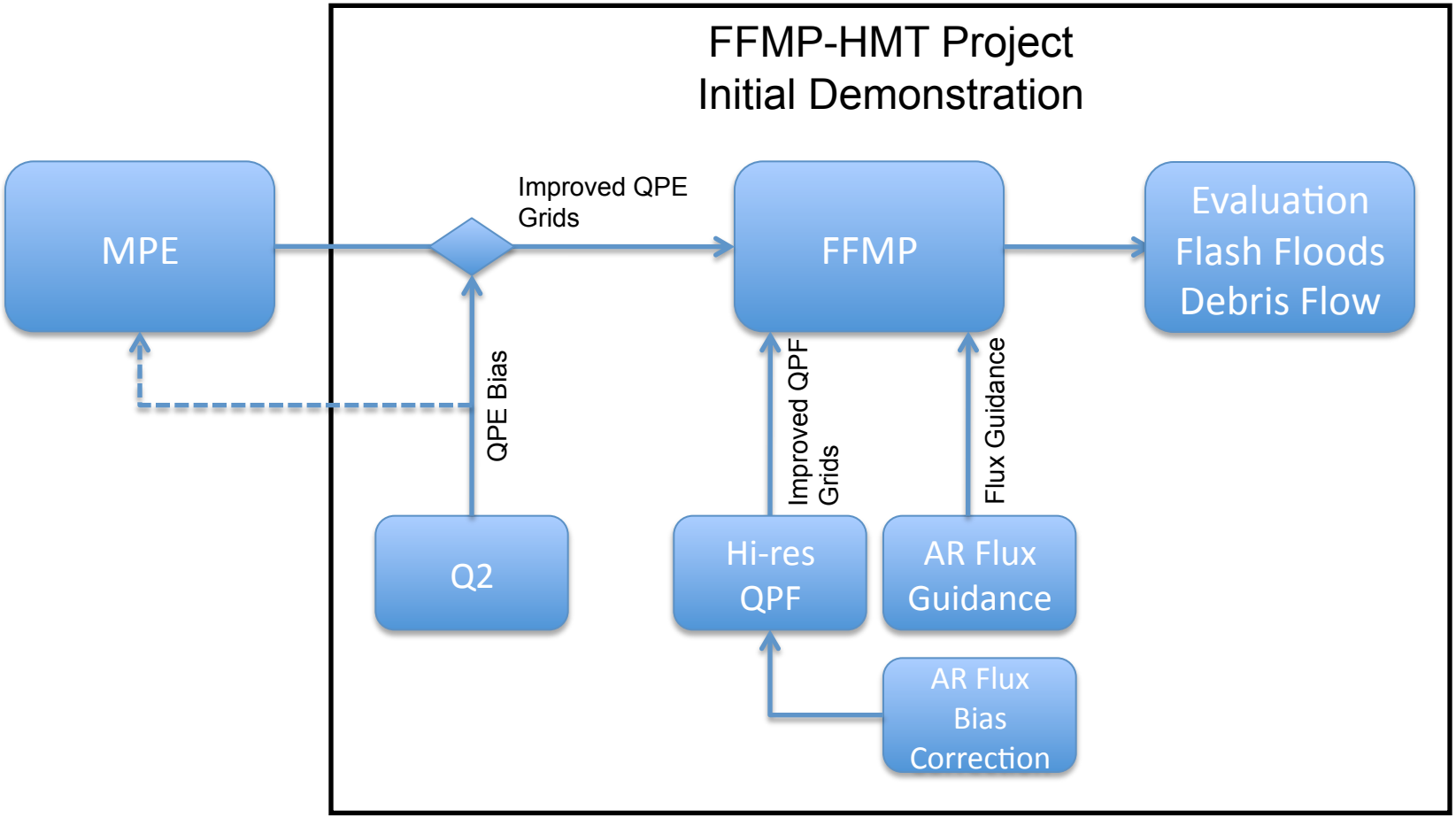
- Carroll Campbell (OAR ESRL-PSD)
- Tom Filiaggi (NWS OST-MDL)
- Dan Gottas (OAR ESRL-PSD)
- Ken Howard (OAR NSSL)
- Janet Intrieri (OAR ESRL)
- Lynn Johnson (OAR ESRL-PSD/CU)
- Paul Neiman (OAR ESRL-PSD)
- Scott O'Donnell (NWS OST-MDL)
- Marty Ralph (OAR ESRL-PSD)
- Dave Reynolds (NWS WFO-MRY)
- Woody Roberts (OAR ESRL-GSD)
- *Tim Schneider (OAR ESRL-PSD)
- Paul Schultz (OAR ESRL-GSD)
- Steve Smith (NWS OST-MDL)
- Allen White (OAR ESRL-PSD)

*Chaired the workshop

** Several one-on-one and/or small group meetings followed on Friday, November 14th

**Other Key People (not in attendance):** Jian-Wen Bao (OAR ESRL-PSD), Andy Edman (NWS WR), Isadora Jankov (OAR ESRL-GSD); John Mcginley (OAR ESRL-GSD), Patricia Miller (OAR ESRL-GSD), David Streubel (NWS WR) Ernie Wells (NWS OCCWS-HSD), Jeff Zimmerman (NWS OCWWS→WR)

# FFMP-HMT Flow Diagram



# Some Acronyms

- ESRL – Earth System Research Laboratory (OAR)
- FFMP – Flash Flood Monitoring & Prediction
- GSD – Global Systems Division (OAR-ESRL)
- HMT - Hydrometeorology Testbed (NOAA)
- MDL – Meteorological Development Laboratory (NWS-OST)
- NSSL – National Severe Storms Laboratory (OAR)
- OST – Office of Science & Technology (NWS)
- PSD – Physical Science Division (OAR-ESRL)
- WFO-MRY – Monterey Weather Forecast Office (NWS)