

02/24/2023

Summary comments and remarks from the Fatima Advisory panel on the 3rd Fatima workshop 22-23 February 2023 at the University of Utah. Compiled and slightly edited by Pardyjak.

Jim Doyle's Comments:

Overall, the measurements from the field campaign are very impressive and quite complete. The presentations have been really interesting. A few comments and thoughts (mostly bigger picture).

- How can these measurements and LES be used to constrain parameterization development? Are there plans for this?
- Are there any studies on model predictability of fog (importance of initial condition error vs. model error) and ensemble approaches to better predict fog
- What are the big gaps that have been missed in terms measurements? e.g., CCN, vertical velocity? Are any of the known gaps will be addressed in the next observing phase over Yellow Sea? Which ones and how?
- How can the groups more effectively work together and bring more of the instruments together (turbulence, microphysics, aerosols, radiative effects) for more of an integrative analysis

Matt Wilbanks's Comments:

- What will be captured in the Yellow Sea that you haven't already collected? What are the gaps/unknowns?
- Propagation data, scintillation measurements, will that be measured / analyzed in the Yellow Sea?
- Arctic experiment – ice and freezing fog – what is the group losing by not making measurements? Is the case to go to Alaska stronger?
- What are the regional differences? – e.g. Aerosols etc. and impact on fog

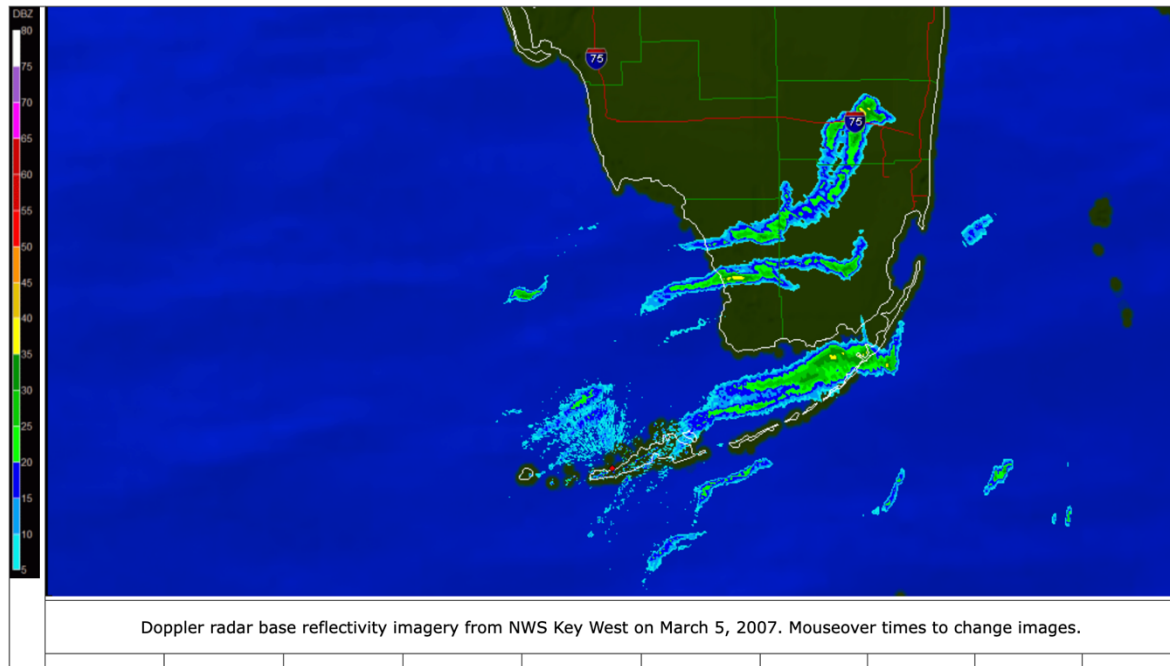
Andy's Comments:

Comments for the Group

- What is the vertical distribution of vertical velocity and turbulence and impact on fog droplet formation?
- Exploit the lidar and radar Doppler measurements to aid in understanding these aspects of the fog formation studied during the FATIMA project.
- Use CHAFF. I discussed this with Ismail and Joe. Also see figure below.
- Turbulence on Sable Island due to instrumented towers affect turbulence estimates? How does Sable Island affect fog formation both upwind and over the island
Use the LES models to evaluate this.

Chaff on Radar Imagery

The series of images below are Doppler radar base reflectivity scans from 1511Z to 1550Z on March 5, 2007 from the National Weather Service (NWS) West site. At first glance, it appears that a collection of unusually linear bands of precipitation were present over southern Florida and the Keys.



- Bimodal droplet spectra 5-micron peak of 200 cm^{-3} . Second mode at 30 microns
 - o How does the second mode happen.
 - o Are there CCN measurements? does that encompass the largest particles?
- How long does it take for the 20-micron droplets to grow from the time of nucleation? This would provide an indication of where the fog initially formed implications for measured vertical velocities.
- Holes have been reported in clouds over lakes relative to over land areas upwind and downwind. Is this a breakthrough finding?
- What is the relationship between lidar extinction and visibility, liquid water content, etc.?
- From the lidar Doppler velocity, when the lidar is vertically pointing, used in combination with the droplet size distributions in the vertical, derive the air vertical velocity.
- Does the LES capture the fog shadows?
- Does the model capture the term that Eric discussed?
- Ismail's talk.
 - o To get the number of droplets from the CCN, need the air vertical velocity. How would you get that from the observations? See Twomey parameterization form N function of vertical velocity.
 - o No measurements of CCN?
 - o Day/Night differences in fog properties and radiative cooling effects
- David Richter talk.
 - o Are the CCN measured during the FATIMA project?
 - o Also, what is the assumed air vertical velocity for activation of the droplets.

- What is the vertical distribution of the droplet size distributions?
- Are you correct that the large droplets fallout before they can be lofted. What are the terminal velocities of the 20-micron droplets? It would be very nice to have a counterflow virtual impactor probe to get the residual nuclei of the activated droplets.
- Stef's talk.
 - It would be interesting to compare upwind, over Sable Island, and downstream.
- Thomas Talk.
 - How about radiative effects/cooling, warming, etc, nighttime compared to daytime.
- Sen Wang gave a very nice and interesting talk.
- Use $N=N_0 \cdot \gamma(\mu) e^{-\lambda \mu D}$, and then derive analytically the equation for V_D for lidar (extinction), radar (reflectivity) to find V_D =extinction or reflectivity relationship, then use measured extinction or reflectivity to derive air vertical motion from Doppler measurements. Actually, also use the droplet size distributions to derive the same parameters. Ismail and I discussed this at length.
- Leyla's talk. A counterflow virtual impactor probe would be a good addition.