



Status of LWC probe Data

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LWC Probe usage:

16 flights 0.53 mm dia, 7 flights 2.1 mm dia

Flight	Probe Nominal Wire Dia (mm)	Serial #	Comments
F1	0.53	2002	
F2	" "	" "	
F3	" "	" "	
F4	" "	" "	
F5	2.1	2005	Changed to be more consistent with King/Nevzorov, and better large droplet response
F6	" "	" "	
F7	" "	" "	
F8	" "	" "	
F9	" "	" "	
F10	" "	" "	
F11	" "	" "	Damage observed on wire, bent in on leading edge like a TWC probe
F12	0.53	2002	Changed because of note above; only 0.5 mm available
F13	" "	" "	Problem during flight with deicing heater
F14	" "	2003	Changed due to note in flight above.
F15	" "	" "	
F16	" "	" "	
F17	" "	" "	
F18	" "	" "	
F19	" "	" "	
F20	" "	" "	
F21	" "	" "	
F22	" "	" "	
F23	" "	" "	

Reminder

Results of preliminary look:

- response of the hot-wire LWC sensor to IWC is about 10% of the IWC. That is about 3 times what we predicted from wind tunnel testing, and makes it difficult to separate true LWC signal from high IWC response.
 - hypothesis is that LWC sensor may be in an enhancement zone for IWC near the skin of the aircraft (factor of 3 enhancement)
 - unfortunate if true, will mask the LWC signal in a high false response to ice
 - Will verify in Cayenne experiment by temporary switch of LWC sensor to robust position (compare LWC/IKP for both locations)
- No indications of large amounts of LWC in Darwin data set, even in convective cells, even at -10 C on flight 23. Note that cannot detect LWC < 10% of the IWC.

Status

Done

- Data have been reviewed, and dry regressions have been performed for each flight
- Raw LWC values have been produced

Proposal

- Provide the Raw LWC values to the HAIC-HIWC team. These raw LWC values include the false response to ice.
 - add Rosemount ice detector data to file to compliment interpretation of LWC data
 - deposit this data set on NCAR field catalog
- Perform assessment of feasibility of removal of false-response-to-ice, and report back to team at next meeting. Need MMD values to perform proper assessment



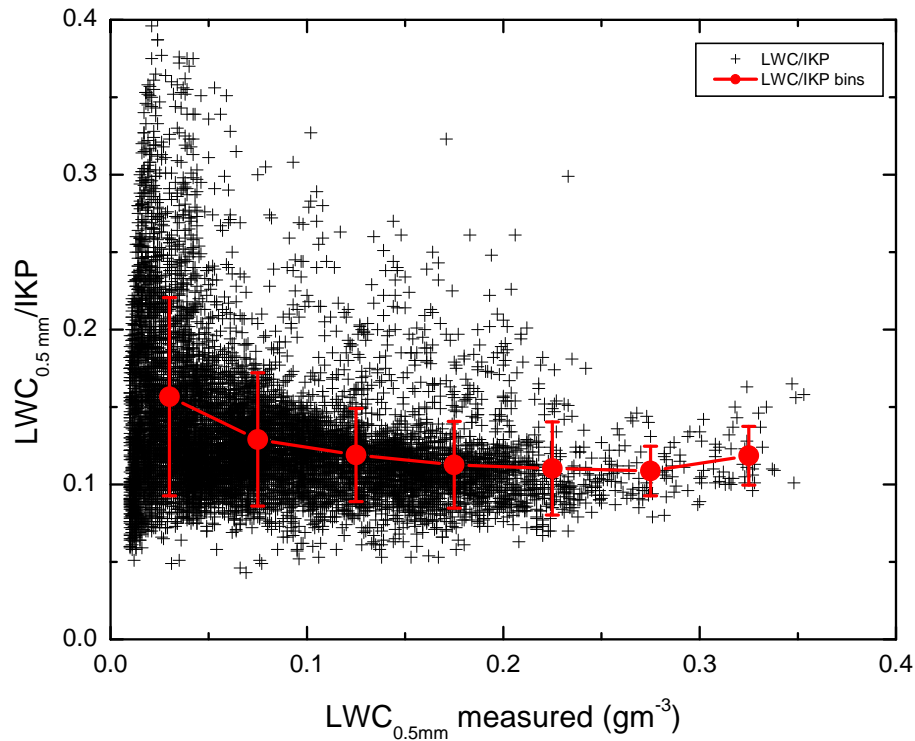
End of presentation

Thank you, merci
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First Look

- Does not appear to be any clear indication of LWC at temperatures colder than -10 C, but no exhaustive study done. More careful investigation including Rosemount Ice Detector required (Ratvasky comment?).
- Dry-term removal is reasonably well handled by Nu-Re type regression, although some additional manual offset removal is required
- Probe is behind the nose-wheel, so data are useless right after takeoff and before landing (while nose wheel is down)
- False response due to ice crystals appears to be higher (~11%) than wind tunnel data (~3-4 %). Possible reasons:
 - Major Failure/error of probe hardware or software somewhere (unlikely)
 - Higher ice response in cloud due to cloud vs. tunnel PSD differences (possible, will investigate trends in data with MMD)
 - LWC probe is in an ice crystal debris zone produced by impacts on the nose of the aircraft, and ice concentrations are locally 2-3 times higher than natural conditions (in my opinion most likely explanation; there are strange results in rain as well with LWC >> Robust).

First Look (0.5 mm wire)



$LWC_{0.5}$ avg	IKP_{avg}	$\frac{LWC_{0.5}}{IKP}$ avg	$\frac{LWC_{0.5}}{IKP}$ std	count
0.03	0.212	0.156	0.064	3686
0.075	0.593	0.129	0.043	2793
0.125	1.097	0.119	0.030	1558
0.175	1.596	0.112	0.028	1064
0.225	2.084	0.110	0.030	360
0.275	2.529	0.108	0.016	104
0.325	2.747	0.118	0.019	51