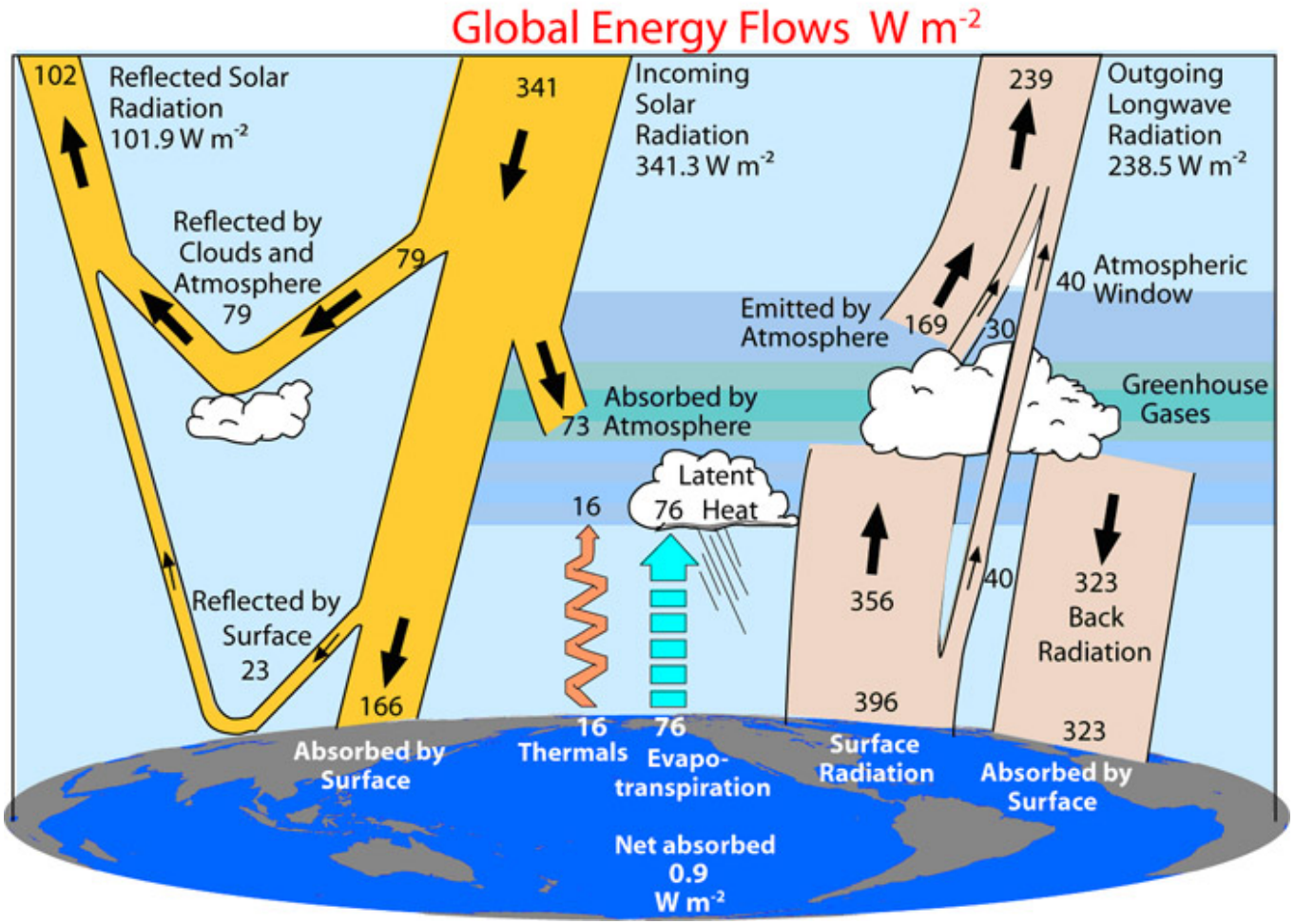
AIR-SEA FLUXES

Estimation Based on the Bulk Flux Algorithm

http://www.rmrco.com/docs

m1309_asr_fluxes.pdf

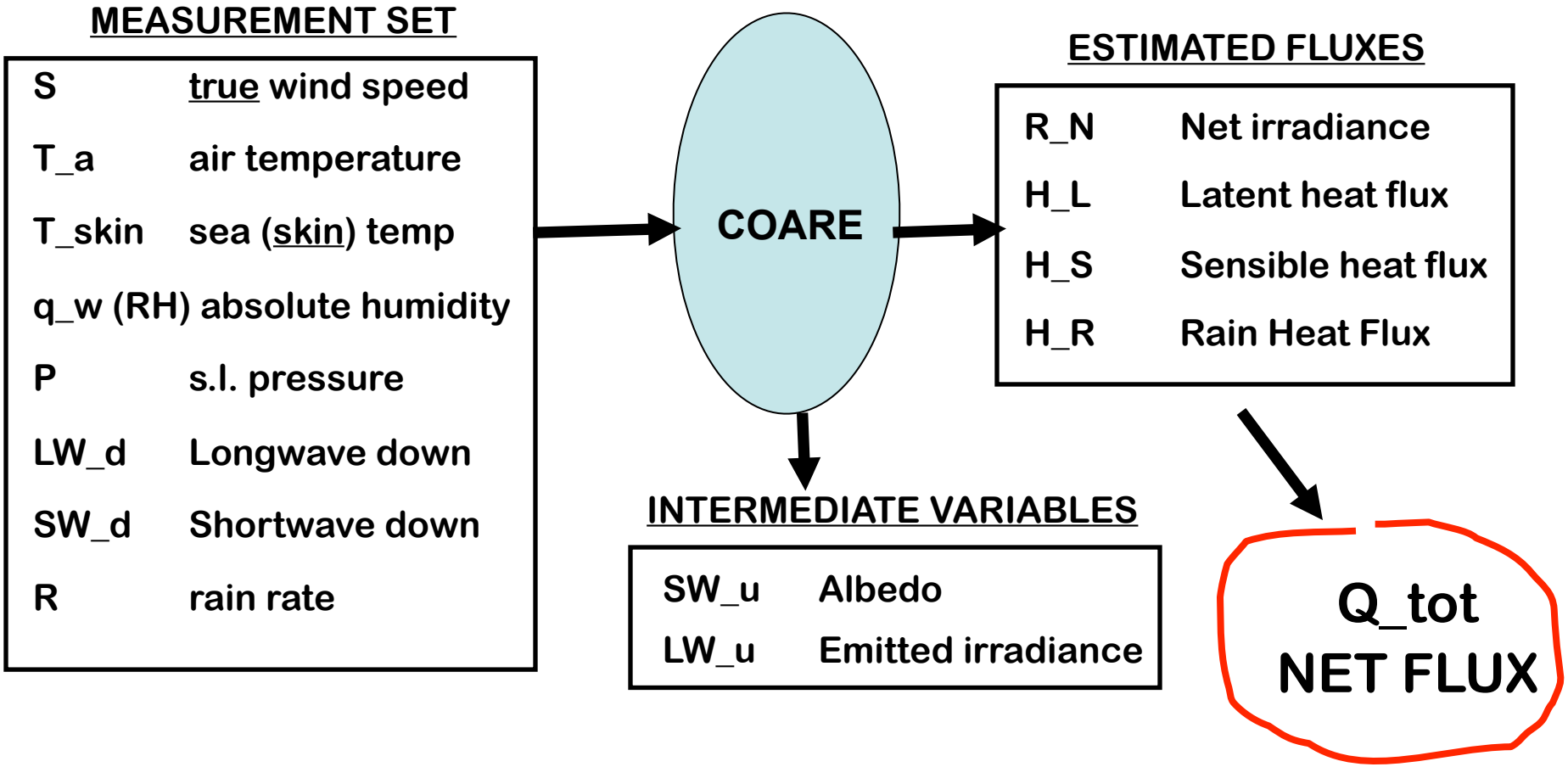
BACKGROUND



Net Flux = SW + LW + Latent + Sensible + Rain

THE BULK METHOD – COARE-3 ALGORITHM

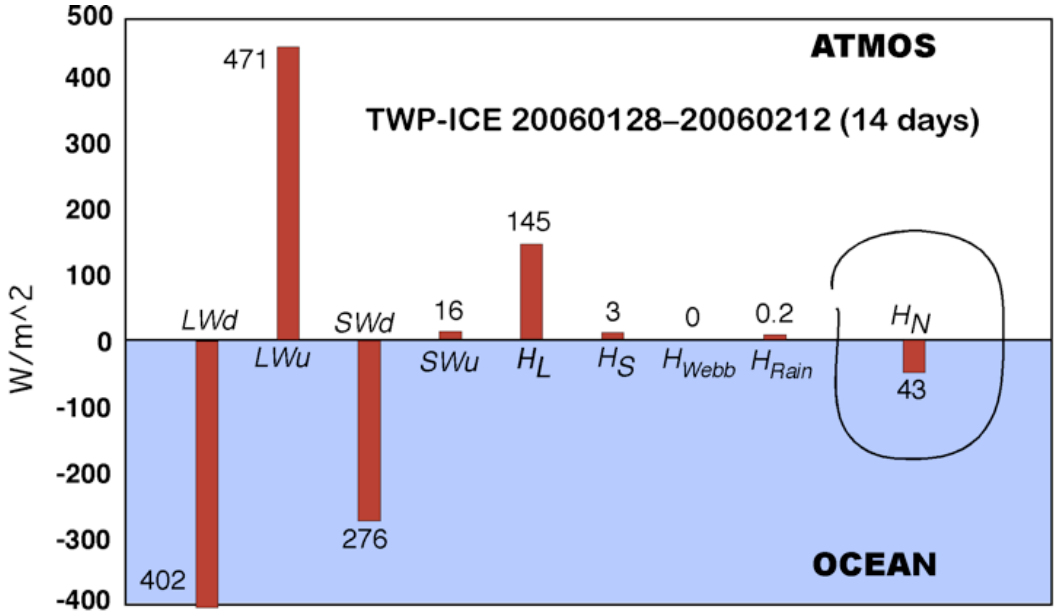
Pawlowicz et al., 2001, EOS, 82 (1) January, 2.

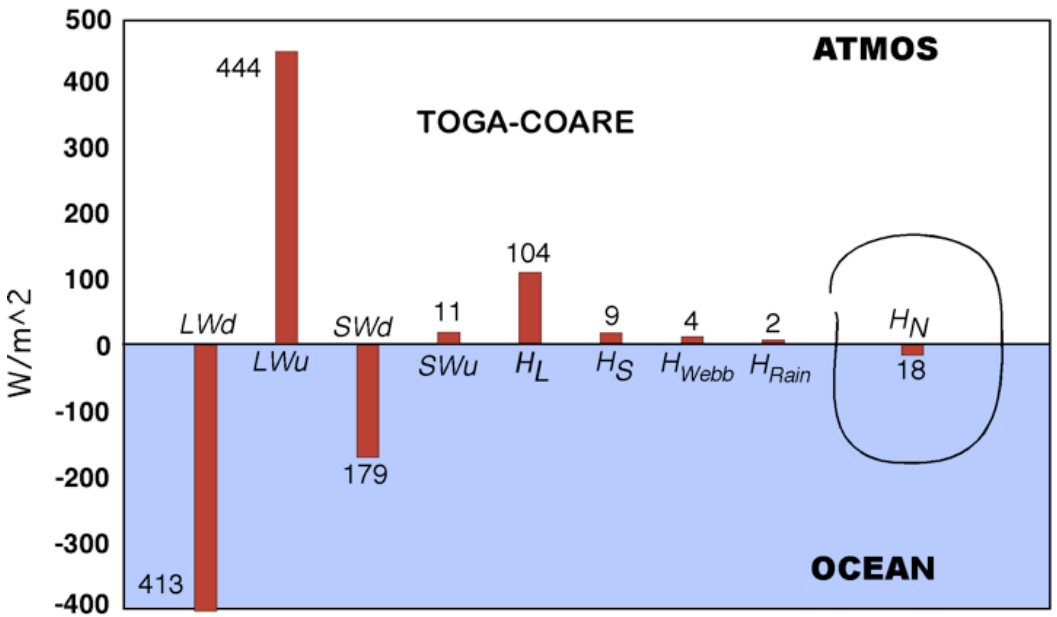


GOAL: Net Flux Accuracy < 10 W/m^2

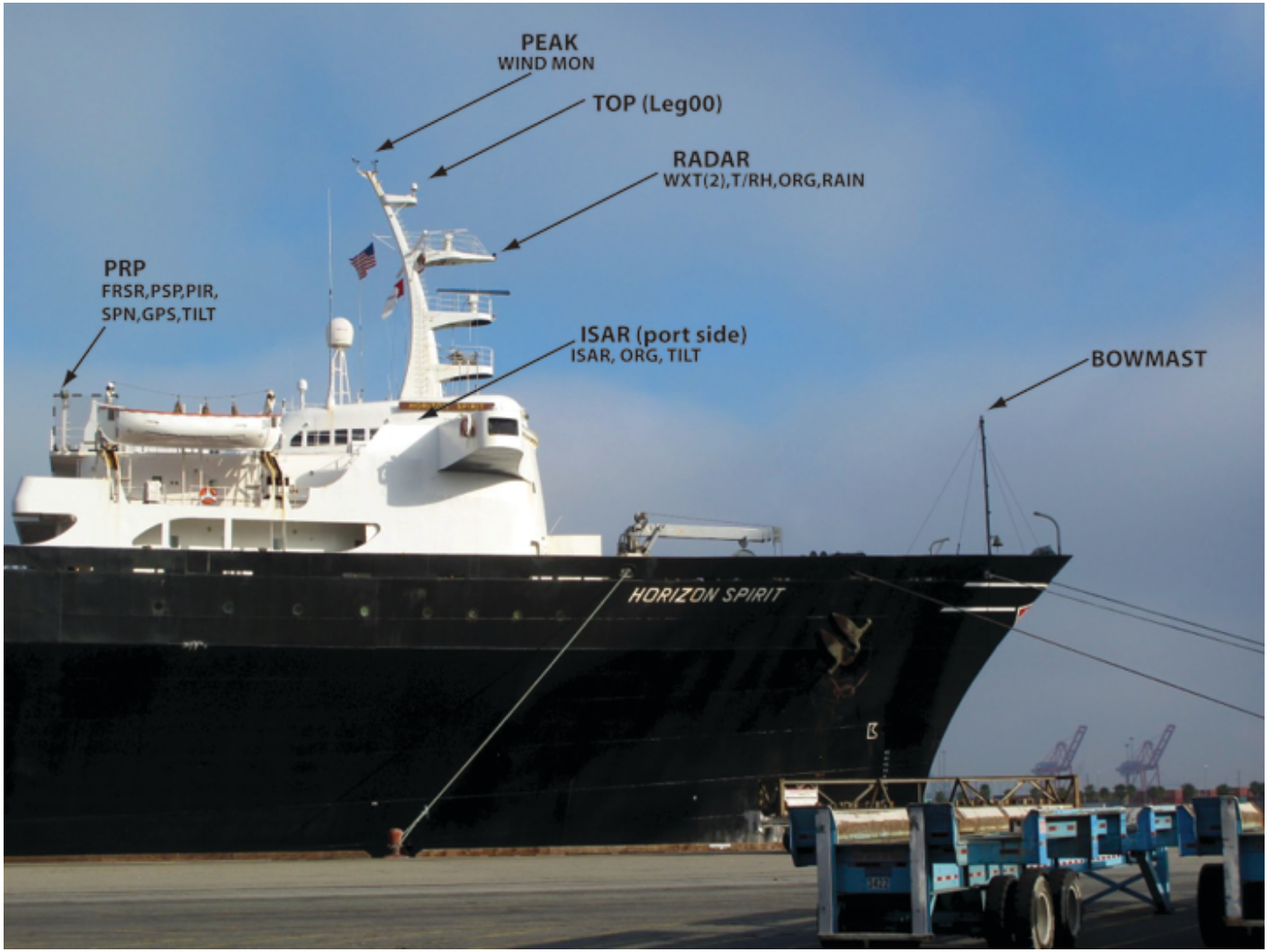
ACCURACIES NEEDED

MEASUREMENT	ACCY	UNITS
WIND SPEED	0.2	m/s
WIND DIRECTION	3	deg
CURRENT SPEED	0.2	m/s
CURRENT DIRECTION	3	deg
AIR TEMPERATURE	0.2	C
OCEAN SURFACE TEMPERATURE	0.1	C
RELATIVE HUMIDITY	2	%
PRECIPITATION	0.4	mm/day
SHORTWAVE DOWN IRRADIANCE	5	W/m^2
LONGWAVE DOWN IRRADIANCE	5	W/m^2
BAROMETRIC PRESSURE	0.1	mbar
PITCH/ROLL	1	deg
PITCH/ROLL STD DEVIATION	1	deg
LAT/LON	0.001	deg
COURSE OVER GROUND	2	deg
SPEED OVER GROUND	0.2	m/s
HEADING	2	deg

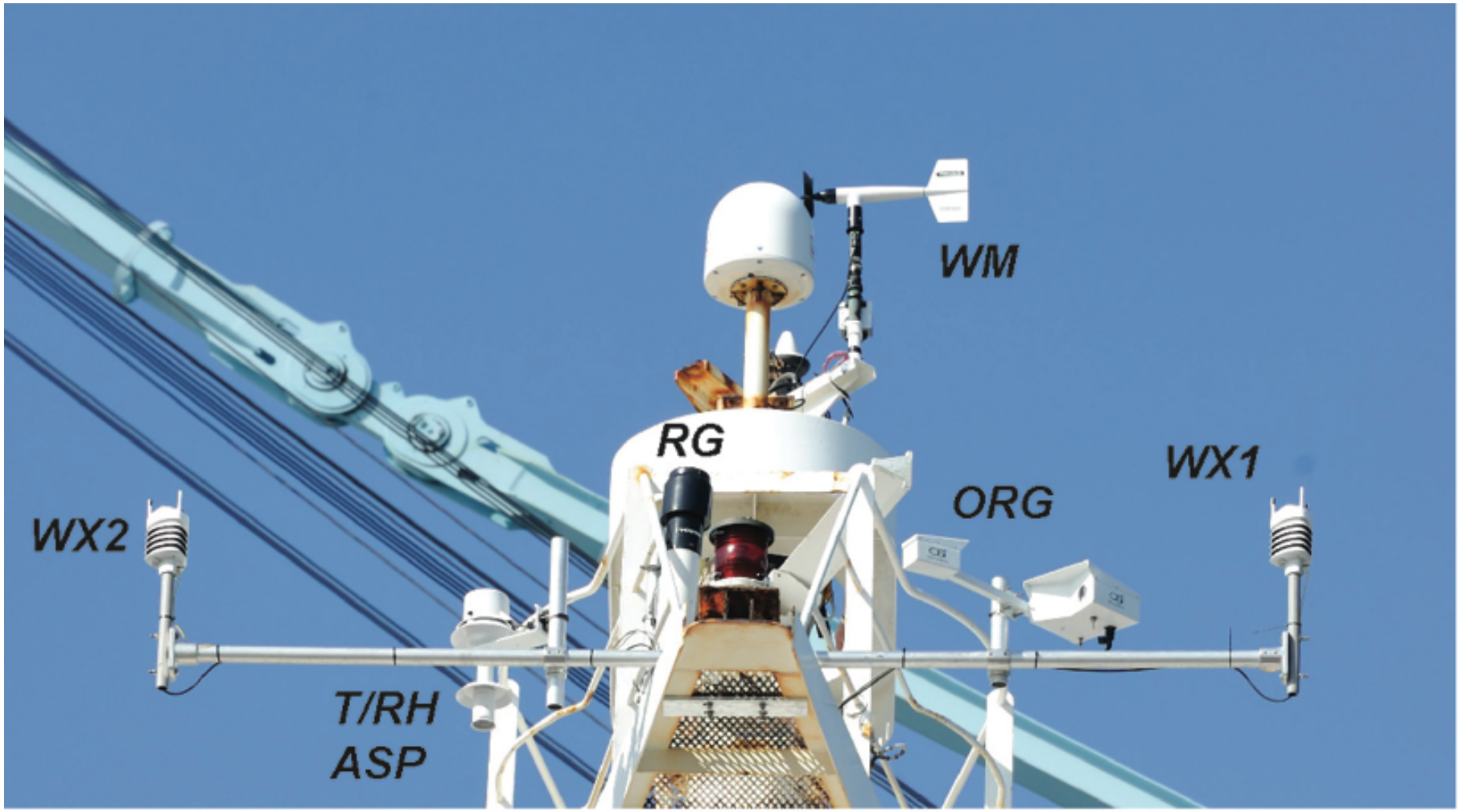

ATMOS
TWP-ICE 20060128–20060212 (14 days)
W/m^2
500
400
300
200
100
0
-100
-200
-300
-400
471
LWd
LWu
402
SWd
276
16
SWu
145
H_L
3
H_S
0
H_{Webb}
0.2
H_{Rain}
H_N
43
OCEAN


ATMOS
TOGA-COARE
W/m^2
500
400
300
200
100
0
-100
-200
-300
-400
444
LWd
LWu
413
SWd
179
11
SWu
104
H_L
9
H_S
4
H_{Webb}
2
H_{Rain}
H_N
18
OCEAN

INSTRUMENTATION



MET1



WX1, WX2 = Vaisala WXT520 (ws,wd,ta,rh,bp,ri)
RG = Young 50203 Siphon Rain Gauge
WM = Young 05106 Wind Monitor

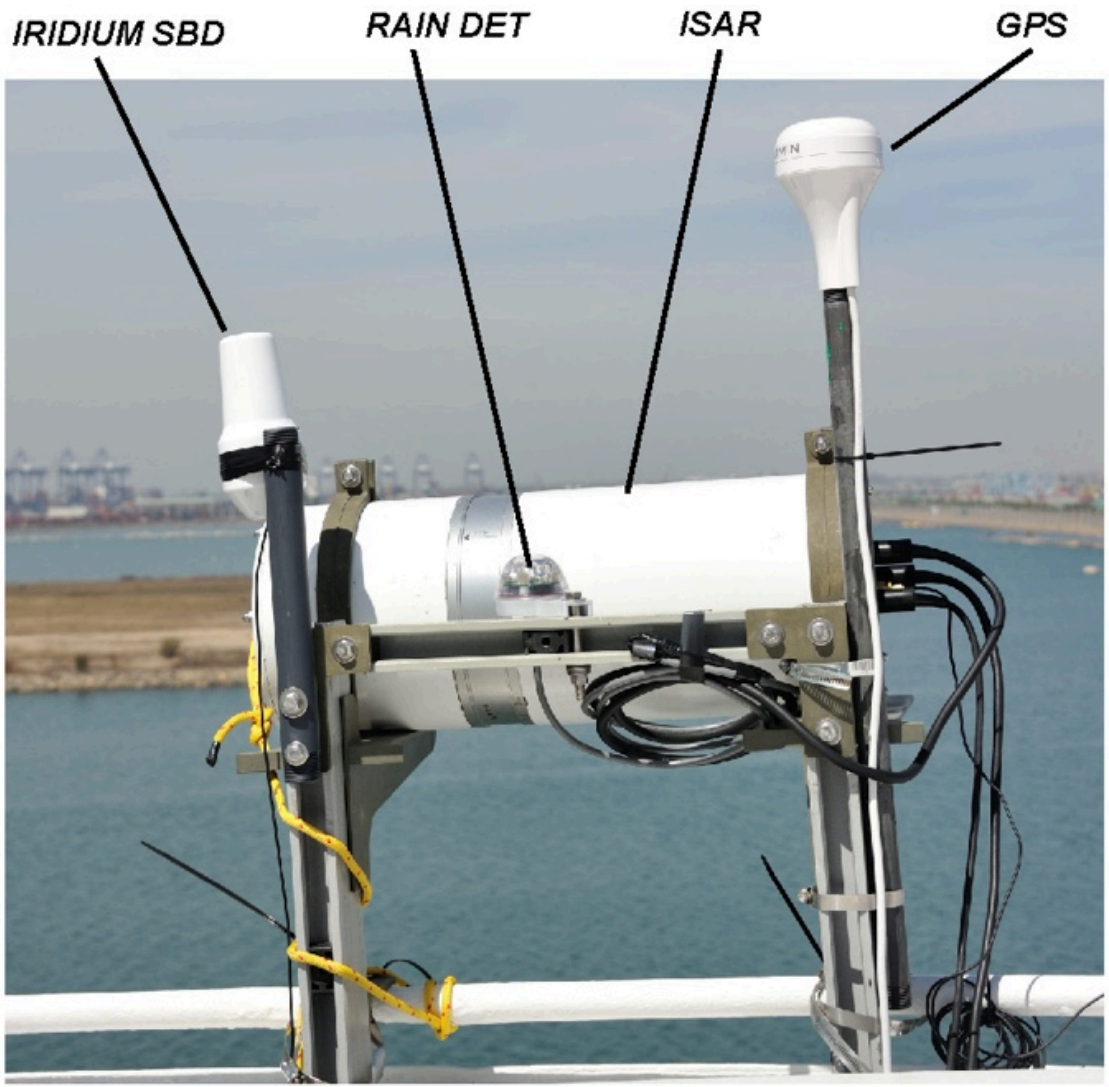
T/RH = Vaisala HMP155, ASP = Aspirator
ORG = OSI Optical Rain Gauge

met-boom

PRP2

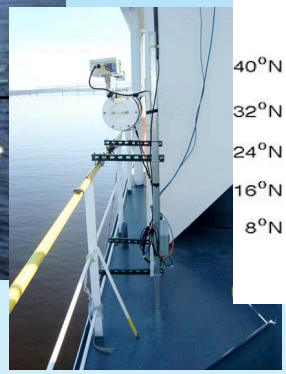
RAD

ISAR

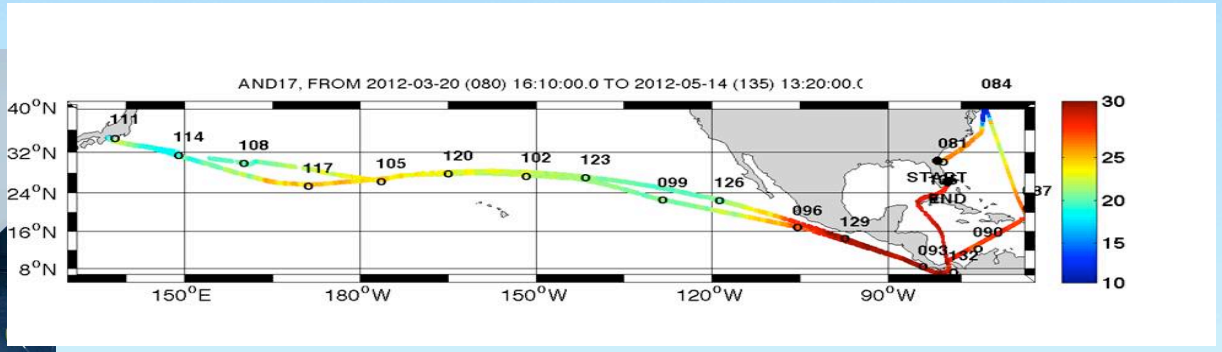


INFRARED SEASURFACE TEMPERATURE AUTONOMOUS RADIOMETER

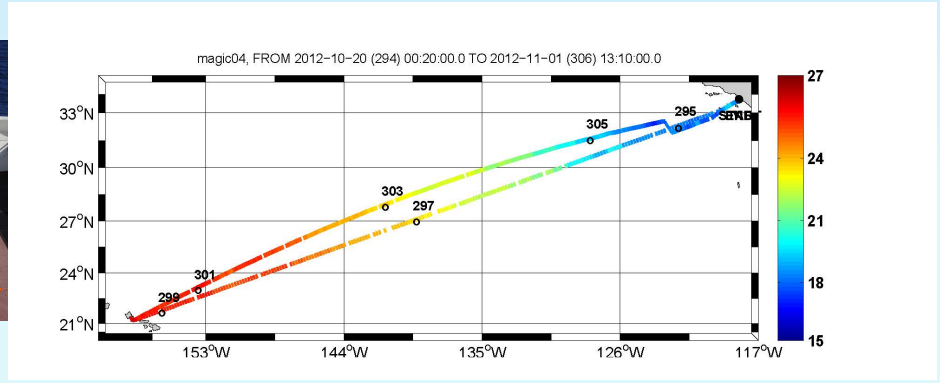
Ship radiometers ISARs



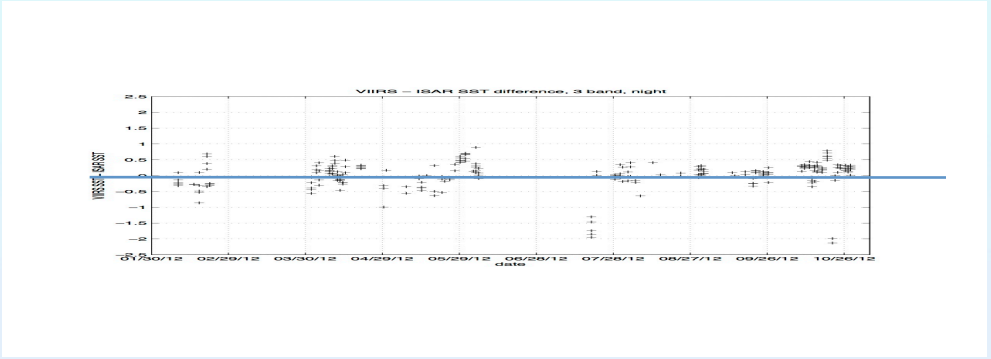
M/V Andromeda Leader



M/V Horizon Spirit



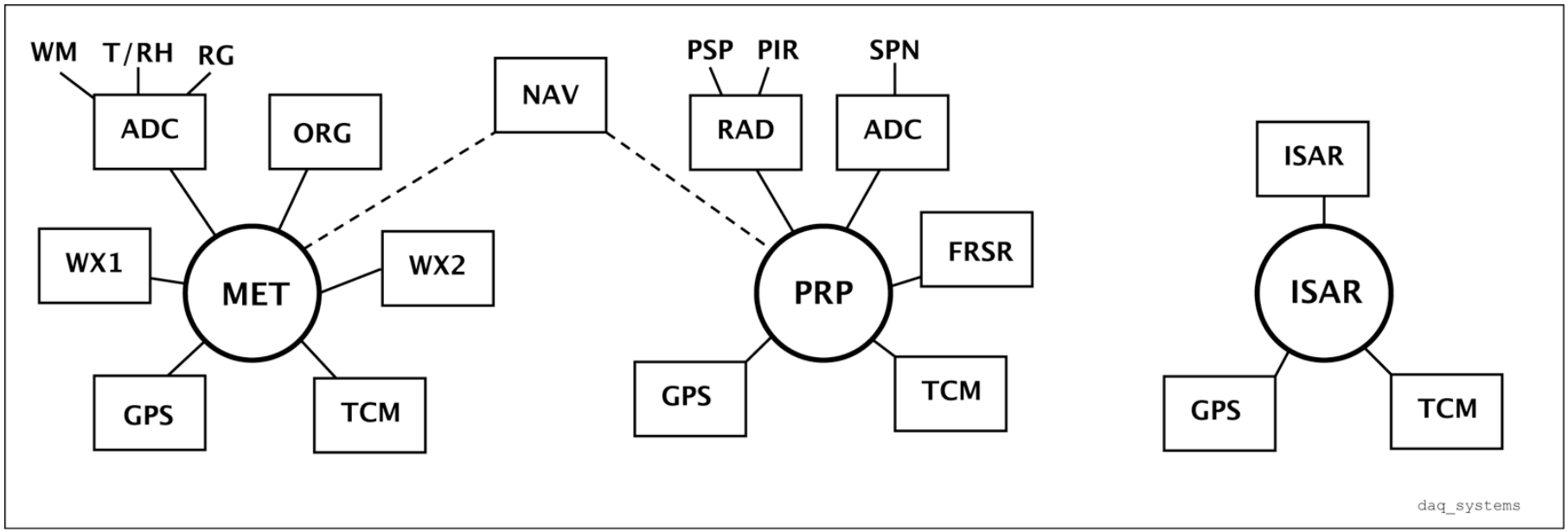
ISARs are autonomous filter radiometers with two internal blackbody calibration targets.
Pre- & post-deployment lab calibration against NIST-traceable calibrators.
Data relayed in real-time by Iridium.



Mean 0.029K, st dev = 0.416K, n = 267

2/15/13

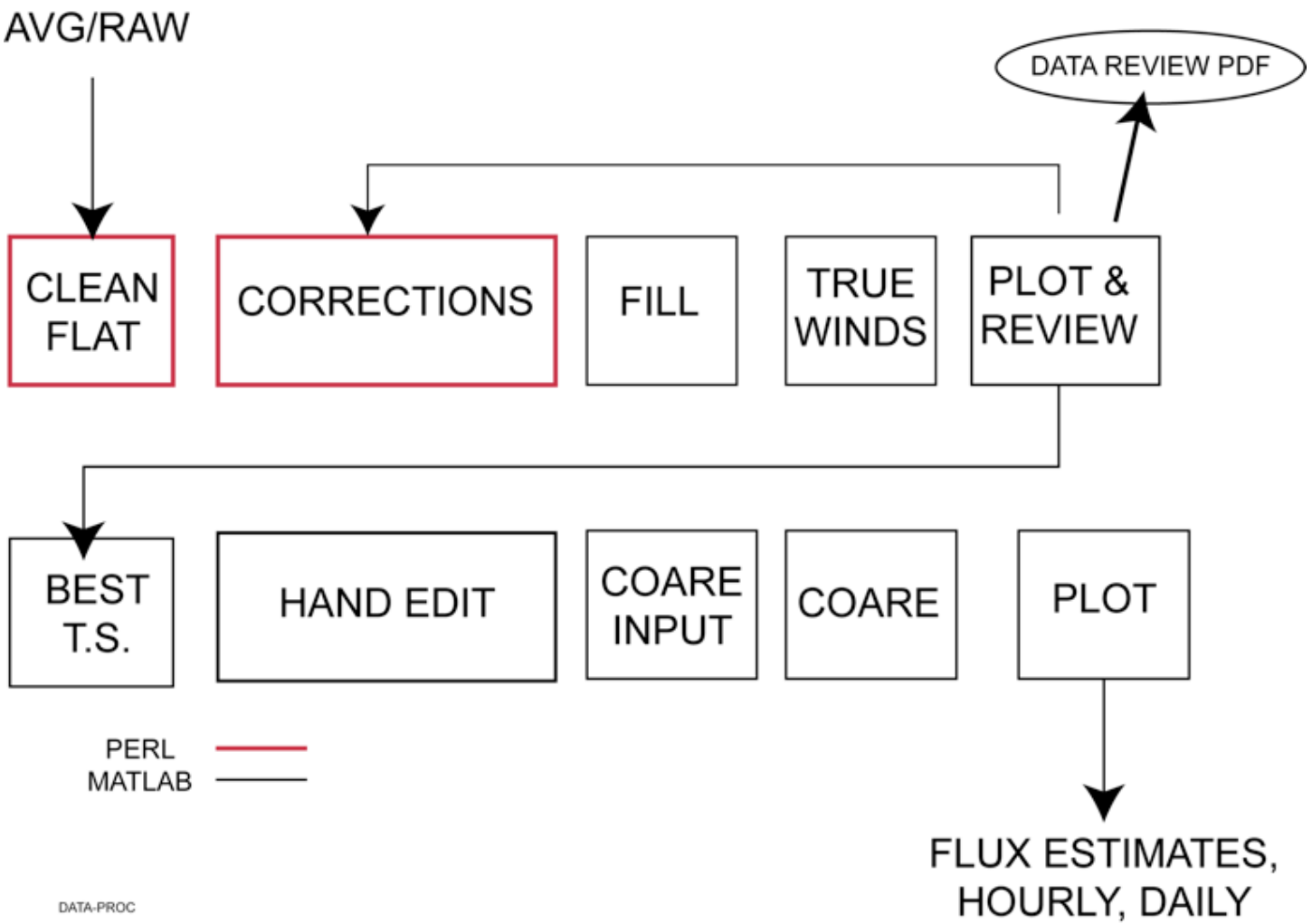
DATA COLLECTION



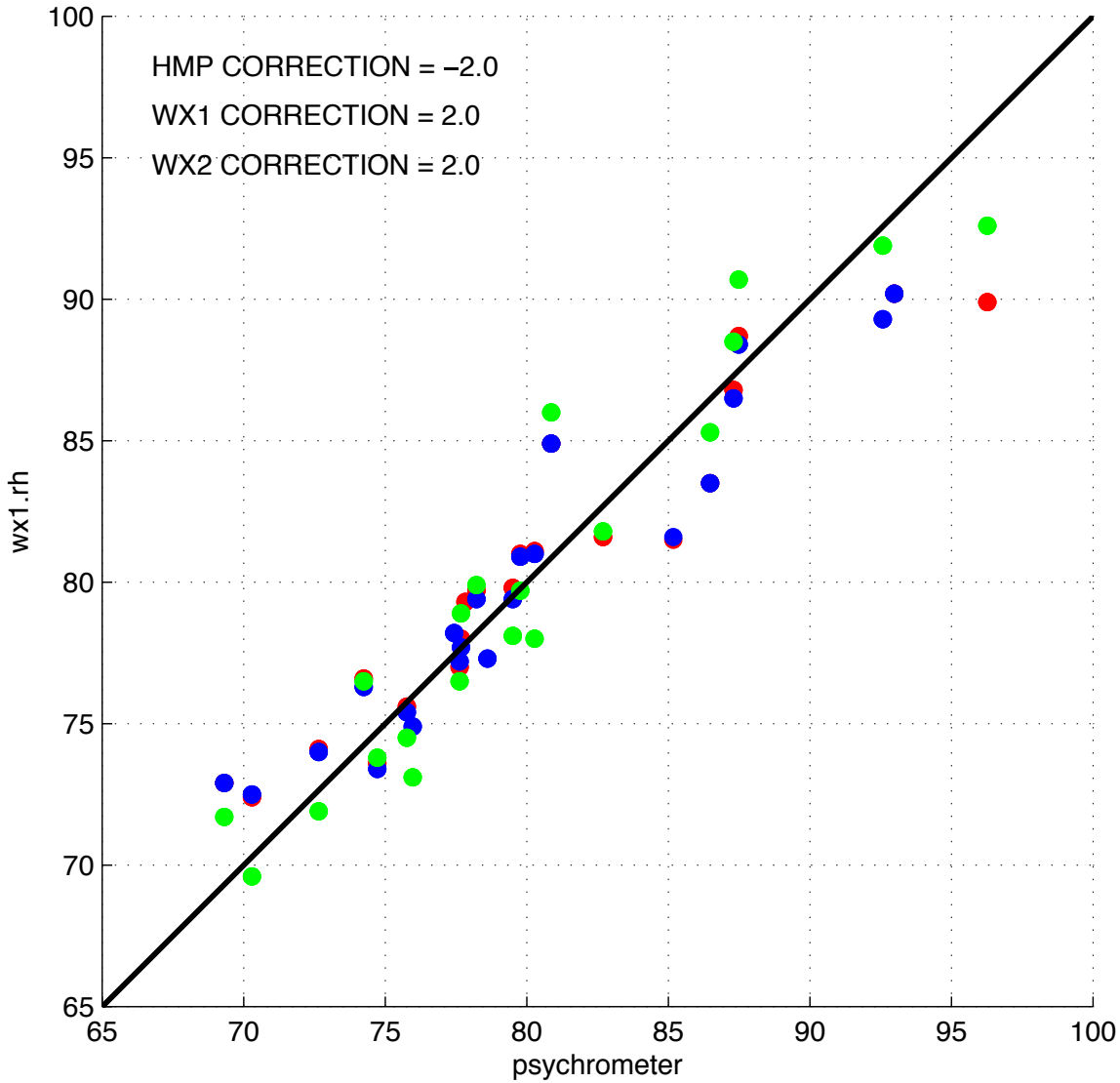
RAW - 1 SEC 600 MB/Leg

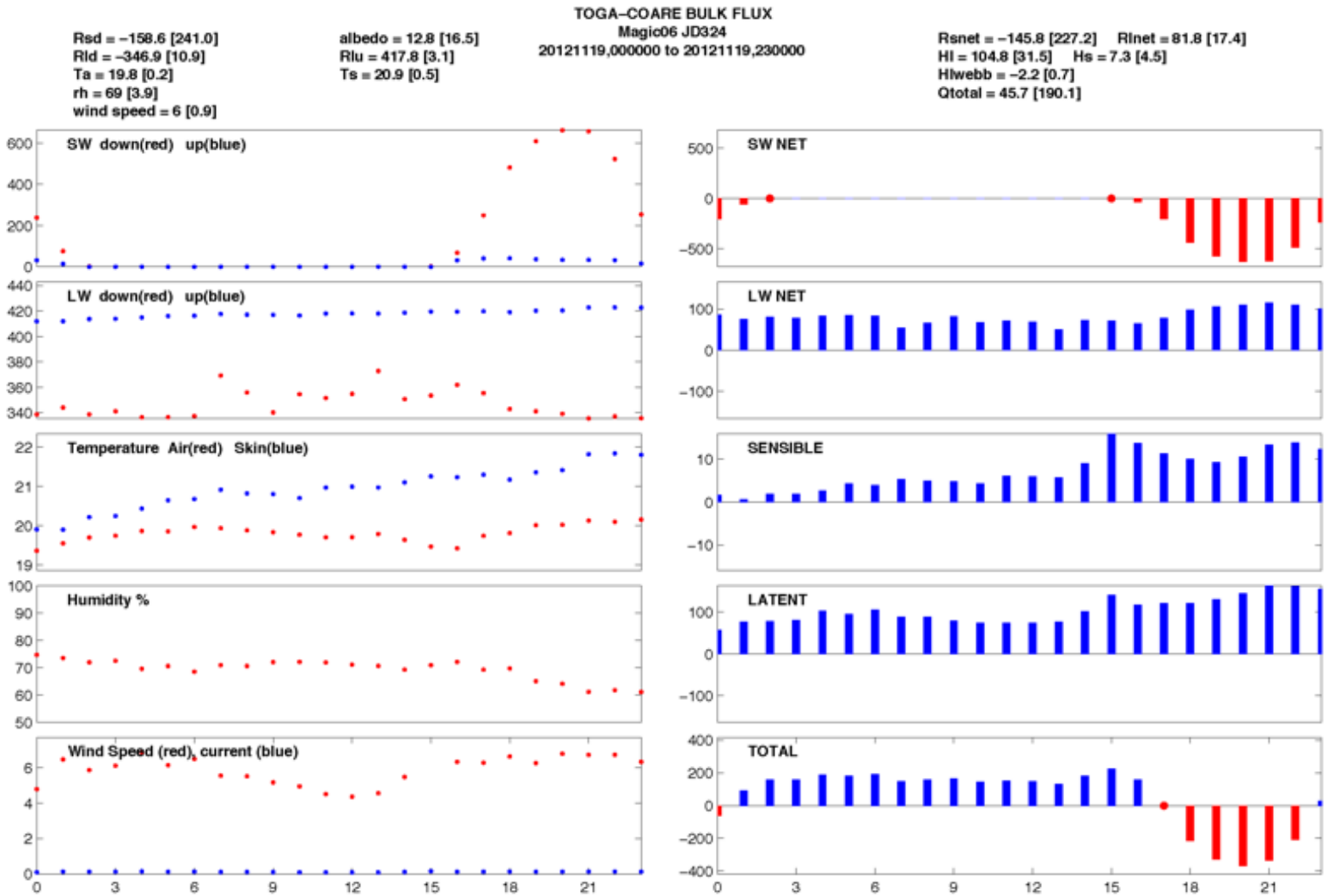
AVG -- 60 SEC 12 MB/Leg

DATA PROCESSING

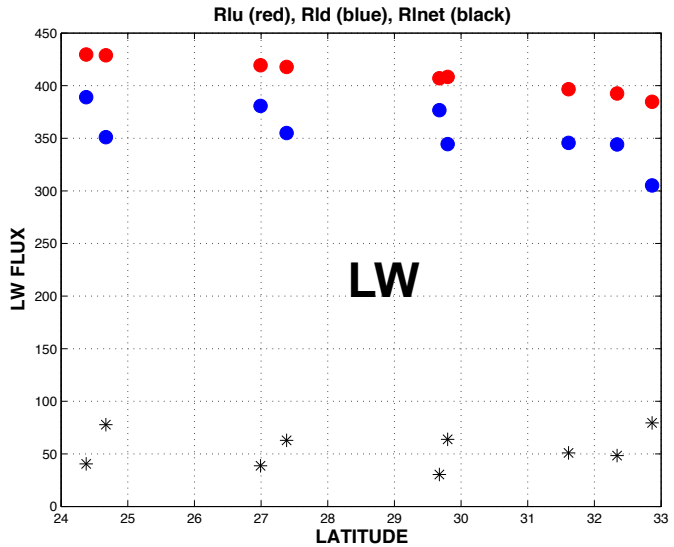


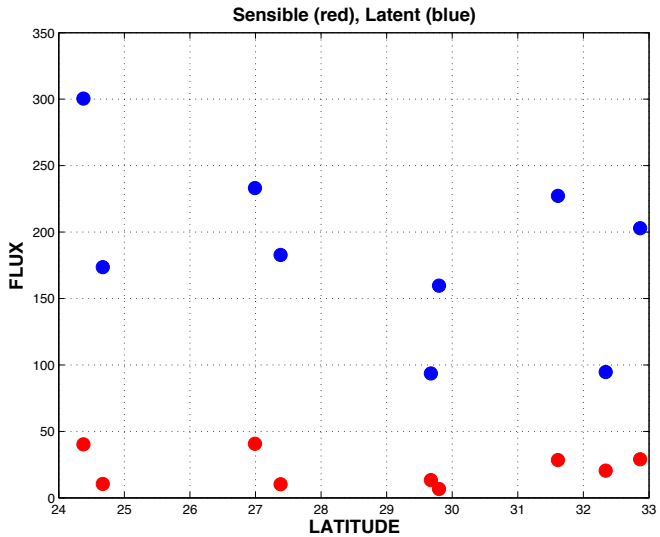
PSYCHROMETER COMPARISON

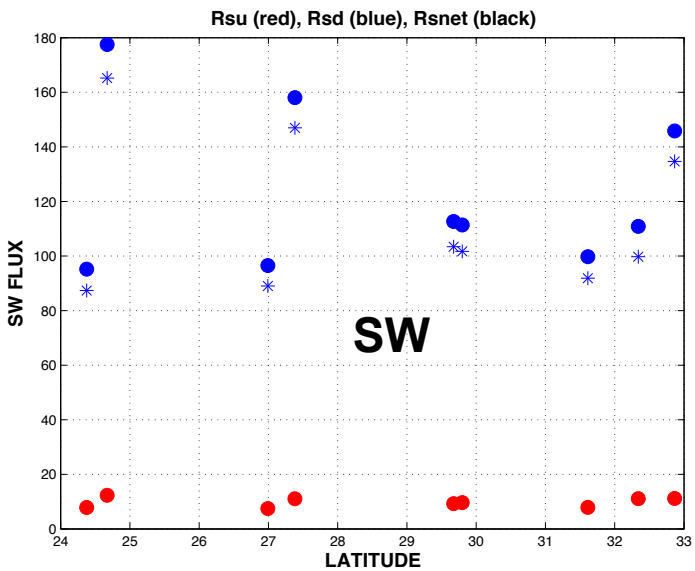


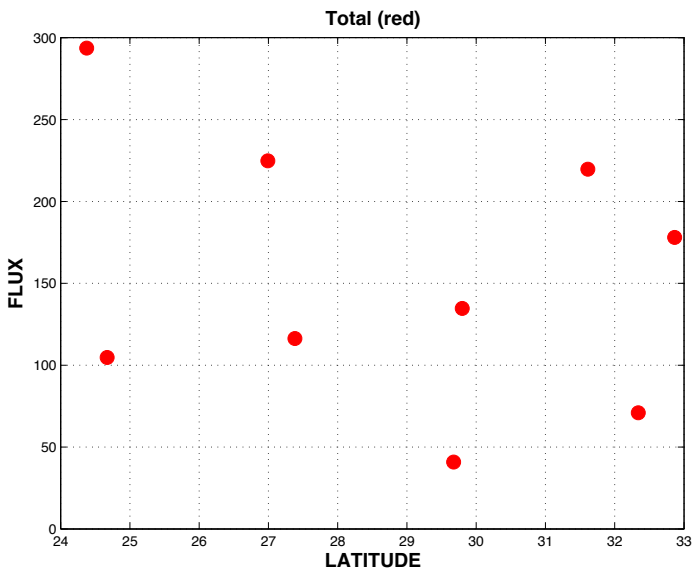

TOGA–COARE BULK FLUX
Magic06 JD324
20121119,000000 to 20121119,230000
Rsd = −158.6 [241.0]
Rld = −346.9 [10.9]
Ta = 19.8 [0.2]
rh = 69 [3.9]
wind speed = 6 [0.9]
albedo = 12.8 [16.5]
Rlu = 417.8 [3.1]
Ts = 20.9 [0.5]
Rsnet = −145.8 [227.2]
Rlnet = 81.8 [17.4]
Hl = 104.8 [31.5]
Hs = 7.3 [4.5]
Hlwebb = −2.2 [0.7]
Qtotal = 45.7 [190.1]
SW down(red) up(blue)
LW down(red) up(blue)
Temperature Air(red) Skin(blue)
Humidity %
Wind Speed (red), current (blue)
SW NET
LW NET
SENSIBLE
LATENT
TOTAL

LEG 8 DAILY AVERAGES









Data Review PDF:
http://www.rmrco.com/docs/m1226_magic06_datareview.pdf

A Guide to Making Climate Quality Meteorological and Flux Measurements at Sea (2006) F. Bradley & C. Fairall, NOAA TM OAR PSD-311 (*avail on rmrco.com)*