Satellite Meteorology – the last 25 years – and the role of CIMSS

by
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CIMSS 25th Anniversary
Madison, Wisconsin
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The US SatMet Program 1980-2005

1980
- Exploitation of Robust POES and GOES Systems
- Era of Microwave Imaging and Sounding Begins

1985
- Return of the “Small Sats”
- An explosion of Data Information and Visualization Systems

1990
- Experimental/Operational SatMet products and the Internet Era

1995
- Transition from “Weather” to Environmental Satellite Systems / NPOESS
- Beginning of Satellite Data Assimilation
- More Active Sensors – Radar, Lidar, Scatterometers

2000
- Prototype System of Systems and the “A-Train”
- Advances from EOS
- GEOSS and the ESAS Decadal Study

2005
Exploitation of Robust POES and GOES Systems

Advanced TIROS-N

- TIROS-N/NOAA series developed from Nimbus and ESSA
- GOES 4-7 from ATS and SMS
- POES now measures clouds, SST, T, q, Ozone, ERB and more

GOES-7

CIMSS leads in product development for the GOES program
Era of Microwave Imaging and Sounding

- Multiple satellite products are blended to create the NVAP dataset.
- January 1, 2000 Total Precipitable Water (TPW) shown here.

CIMSS and other groups begin to combine microwave, visible and infrared data

(Vonder Haar et al. 2005)
Return of the “Small Sats”-1984

• This NASA/CSU/BALL/TRW Mission joins SAGE, TRMM, QuikScat and others to add to US Environmental Satellite research and operations

CIMSS and many other scientists join science teams for the small satellite missions
An Explosion of Data Information and Visualization Systems

CIRA, CSU real time GOES image transmitted to NWS, DEN, July, 1980

• McIDAS, ADVISAR, RAMSDIS, AWIPS et al. bring SatMet products to many users

CIMSS, SSEC develops real time products for Miami, Kansas City and more
More Active Sensors: RADAR, LIDAR, Scatterometer

DJF 99/00 QuikScat Mean Winds

TRMM RADAR

CIMSS, CIRA and others develop cross-sensor forecast products
Experimental/Operational SatMet Products and the Internet Era

• Many research-to-operations groups place new SatMet products on the web – to the forecasters delight!

**Black**: 100-250 mb  
**Cyan**: 251-350 mb  
**Yellow**: 351-500 mb

**GOES-12 water vapor winds from CIMSS**  
7, 14:15 UTC

**GOES Sounder Total Precipitable Water**  
July 7, 14:00 UTC from CIMSS
**Era of Satellite Data Assimilation**

- From 1995 onward global assimilation of cloud-free satellite radiances shows positive impact
- Today we focus on global and regional DA in cloudy cases (4D assimilation of GOES imager IR multi-layered non-convective case)

(Vukicevic et al. 2004)
By mid 2005, we expect to have a wide range of different sensors, active and passive, optical, infrared and microwave, hyper-spectral to coarse band, all approximately viewing Earth at the same time.

We are left to pose a strategy that optimally combines these measurements, converting them to meaningful information with verified uncertainties. (G. Stephens, 2005)
CIMSS, CIRA, CICS and others have assisted the education of many in our field

Are we training and entraining enough young scientists and engineers?
More background on the last 25 years

For 1960-1995


For 1995-2005

(2nd Ed. of above, 20xx)
To the Scientists
+ Staff of CIMSS,
SSEC, UW,
In appreciation for your
many contributions to and fine
collaborations within the field of Satellite Meteorology!
On the occasion of your

Stan Kidder

Tom Vonderhaar
Back up slides
Comparison of the Total Column Water Vapor, Sea Surface Temperature, and Lower Tropospheric Temperature Anomalies - Global Means

Three Independent Satellite Measurements – Highly Coupled

Mt. Pinatubo Eruption March 1991

Major El Nino begins May 1997
FIGURE 4.21. Areas viewed by geostationary meteorological satellites. The solid line shows the limb; a satellite sees nothing outside this area. The dashed line encloses the area of useful data where the satellite is at least 10° above the horizon.