Reflections on Twenty Five Years at CIMSS

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NOAA/NESDIS/ORA
Cooperative Institute for Meteorological Satellite Studies (CIMSS)
Madison, Wisconsin

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CIMSS has flourished because of

good leaders leading good people
interesting science
instruments and cal/val
processing and visualization
algorithms and applications
multitudes of data
steady sponsorship from NASA and NOAA
basic research
transfer to operations
strong international partnerships
global observing system
Verner Suomi started it all
He had some friends
UW - NOAA - NASA have been working together for many years
Some early examples include:

* first meteorological satellite experiment in 1959
  Suomi’s net flux radiometer on Pioneer VII
* first geostationary satellite in 1966
  Suomi and Parent’s spin scan cloud camera on ATS-1
* processing system to display, navigate, loop images
  McIDAS
* archive of GOES data
  videocassette synched to satellite spin
* first geostationary sounder
  VAS in 1981
In 1966, ATS-1's geostationary spin scan cloud camera provided full disk visible images of the earth and its cloud cover every 20 minutes.

― Verner Suomi

“the clouds moved - not the satellite”
NOAA / NESS sends a small group to work with Suomi et al
* The NESS Development Lab locates at UW
  Dave Small starts in 1975
  Bill Smith & Kit Hayden bring their groups to SSEC
* First visiting scientist comes

Soundings become NESS / UW project
* TIROS-N in 1978 became the operational polar sounder
  NESS DL developed the sounding software
* VISSR Atmospheric Sounder preparations intensify
  Larry Sromovsky & Hank Revercomb are UW leads
  first geostationary sounding is made in 1981
Some of us looked different then
Bill recruits CIMSS visiting fellows from Down Under
FGGE produces the first global wind data sets
  * First GARP Global Experiment in 1979
  * Connections with European community strengthen

CIMSS formalizes UW/NESDIS arrangement with MOU
  * Vern Suomi is first Director in 1980
    SSEC maintains data rich environment for CIMSS
  * Smith becomes 2nd CIMSS Director
  * ASPP formed to do NOAA Operational VAS Assessment
Meteosat water vapor tracers supplemented FGGE winds
This picture was included in 1978 Christmas Greetings from Vern Suomi to Pierre Morel
European-CIMSS connection starts early and stays strong
Members of the Meteosat Family that have visited CIMSS
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The National Aeronautics and Space Administration
Presents the
Group Achievement Award
to the
VAS Demonstration Team
Goddard Space Flight Center
In recognition of the implementation of a successful demonstration of the capabilities of a new atmospheric sounding system which is now being used as a baseline for the operational implementation of geosynchronous soundings.

Cooperative Institute for Meteorological Satellite Studies (CIMSS)
University of Wisconsin

Signed and sealed at Goddard Space Flight Center
this fourth day of December, Nineteen hundred and eighty-one.

[Signature]
Director, GSFC
CIMSS gets praise from NESDIS Administrator

William P. Bishop says in article on partnerships in remote sensing in (Nov 1986)

“...a cooperative institute (CIMSS) at the UW...has had an enormous on the geosynchronous satellites...in fact it may have had the largest impact on those satellites and their use of any single institution”

this one partnership...on three occasions (cloud winds, archive of images, and soundings from VAS)...demonstrated...the best ways in which government-academic partnerships work to enormous benefit”
CIMSS connects with international remote sensing family
* First international TOVS Study Conference in 1983
* China - CIMSS ties strengthen with visiting scientists

High spectral IR resolution takes off
* HIS is built and flown in 1980s
* Interferometer almost makes it onto GOES I/M
* NASA commits to AIRS for EOS
* EUMETSAT starts IASI efforts
ITSC-1 leads to ITSC-14 with record audience in Beijing

The 14th International TOVS Study Conference
第14届国际泰罗斯业务垂直探测研讨会
(25–31 May, Beijing, China)
CIMSS-China ties have grown over 25 years
CIMSS connects with international remote sensing family
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→ High spectral IR resolution takes off
  * HIS is built and flown in 1980s
  * Field experiments demonstrate high spectral IR data
  * Interferometer almost makes it onto GOES I/M
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Scanning HIS

Characteristics
Spectral Coverage: 3-17 microns
Spectral Resolution: 0.5 cm\(^{-1}\)
Resolving power: 1000-6000
Footprint Diam: 1.5 km @ 15 km
Cross-Track Scan: Programmable including uplooking zenith view

Applications:
- Radiiances for Radiative Transfer
- Temp & Water Vapor Retrievals
- Cloud Radiative Prop.
- Surface Emissivity & T
- Trace Gas Retrievals
NASA joins UW and NOAA in MOU in 1989
  * Smith, Tilford, and Pyke expand collaboration

Remote sensing and CIMSS continue to evolve
  * GOES I/M replaces VAS in 1994
  * Winds processing gets boost from Intl Winds Workshops
  * AERIs and MAERIs prove their worth on land and sea
  * First operational soundings from geo
  * Hayden retires and Smith departs in 1997
    Don Johnson becomes Director
  * NOAA plans for interferometers in leo (CrIS) and geo (GOES ABS)
GOES-I launch
Second International Winds Workshop is held in Tokyo Japan

Five geos providing global coverage for winds in tropics and mid-lats with comparable quality
MAERI high spectral resolution detects daytime surface skin heating in clear skies

Skimmer (green) warmer at night and cooler in day

MAERI marks solar heating of sea surface skin

AERI marks water vapor changes

↑ solar heating showing up
Oklahoma City Tornado 3 May 99

View from space

1200 UTC

1300 UTC

1400 UTC

1500 UTC

530 CDT (2330 UTC)

View from ground
Director
Don Johnson

Kit Hayden as we remember him
CIMSS closes out the millennium
* Steve Ackerman becomes Director
* NASA commits to GIFTS but…
* EOS becomes a reality
* Madison skyline changes for direct reception of EOS

Since 2000
* MODIS polar winds fill observing system gap
* AIRS shows significant NWP impact
* Intercalibration of IR sensors becomes state of the art
* International community connecting through WMO
MODIS Band 2: 250 meter resolution
UW-Madison Direct Broadcast 2000/10/13 1559 UTC

Cooperative Institute for Meteorological Satellite Studies
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MODIS fills polar gap in wind coverage

forecast busts are mitigated

500 hPa geopotential anomaly correlation

AV: 0.909 (Control)  AV: 0.917 (Exp: with MODIS)
AIRS adds to GOS & provides positive NWP impact at JCSDA

N. Hemisphere 500 mb AC Z
20N - 80N  Waves 1-20
1 Jan - 27 Jan '04

500 hPa geopotential anomaly correlation

Forecast [days]
**Intercomparison of 2 Marine AERIs Measuring Sea Surface Temperature**

**16 Day Cruise**

Largest Daily Mean Difference: 0.020 K
Ten Day Mean Difference: 0.005 K

**AIRS Validation with SHIS**

Mean over AIRS modules (same color) generally <0.1 K!

**Summary of AIRS-MODIS mean Tb differences**

Red=without accounting for convolution error
Blue=accounting for convolution error with mean correction from standard atmospheres

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**Cal/val of IR obs is now concerned with tenths of K, not degrees of K**

**High spectral IR is an important part of the reason**
SHIS Support comes from NASA Ames and the Mango Kings
Evolving the Global Observing System

Working towards IGeoLab

WMO Team
CIMSS education and outreach has touched many people

* 103 students graduate from AOS with CIMSS advisors
  most take jobs in govt labs
* education and training
  in classrooms at UW
  in the virtual laboratory everywhere
* over 50 visiting scientists spend a sabbatical at CIMSS
  every continent participates
CIMSS Graduate Students

1979-1980
Michael Kalb MS (NASA Marshall)
Tony Siebers MS (NWS)
Jim Block MS (NWS)

1980-1981
Jim Zandlo MS (private sector)
Roberta Marshment MS (private sector)

1981-1982
George Diak PhD (CIMSS)
Roy Spencer PhD (NASA Marshall)
Chris Velden MS (CIMSS)
David Keller MS (Air Force)

1982-1983
John Bates MS (NOAA ERL)
Gin Rong Liu MS (Taiwan National U)

1984-1985
David Donahue MS (NESDIS)
Stacey Heikkinin MS
Martin Mlynczak MS (NASA Langley)

1985-1986
John Bates PhD (NOAA ERL)
Allen Huang MS (CIMSS)
Chris Moeller MS (CIMSS)
Craig Burfeind MS (private sector)

1986-1987
Louis Garand PhD (Environment Canada)
Gin-Rong Liu PhD (Taiwan National U)
Gary Jedlove PhD (NASA Marshall)
Fred Wu MS (CIMSS)
Maria Perrone MS (Rutgers University)
Tim Schmit MS (CIMSS)

1987-1988
Nelson Ferreira PhD (INPE, Brazil)
Richard Frey MS (NASA Langley)
Arlindo Arriaga MS (EUMETSAT)
Grant Carlson MS (NASA Marshall)

1988-1989
Hyoasang Chung MS (Korea Met Agency)
Laurie Rokke MS (PhD at Oxford)
Liam Gunmey MS (GSFC and CIMSS)
Kurt Brueske MS (Air Force)
Murty Divakarla MS
Elaine Prins MS (CIMSS)
Chris Scheuer MS (NASA Langley)

1989-1990
Allen Huang PhD (CIMSS)
Fred Wu PhD (CIMSS)
Steve Nieman MS (CIMSS)
Walt McKeown MS (Navy)
Hai Yen Zhang MS (CSU)

1990-1991
Arlindo Arriaga PhD (EUMETSAT)
Peter Keen MS (NASA Goddard)
Yanni Qu MS (NESDIS)

1991-1992
Robert Purser PhD (NCEP/EMC)
Kathy Strabala MS (CIMSS)

1992-1993
Daphne Zaras MS (NOAA/NSSL)
Chia Lee MS (CIMSS)
Rongrong Xie MS (NESDIS)
Jason Li MS (NASA Goddard)

1993-1994
Walt McKeown PhD (Navy)
Gilberto Vicente PhD (NASA GSFC)
Xiaohua Wu PhD (Univ. of Chicago)
Wayne Feltz MS (CIMSS)
Tim Olander MS (CIMSS)

1994-1995
Yanni Qu PhD (NESDIS)
Susan Faust MS (NWS)
Lan Ge MS (NESDIS)
Ben Ho MS (NASA Langley)

1995-1996
Jack Dostalek MS (CIRA)
Nick Nalli MS (NESDIS)
Brad Hoggatt MS (private sector)
Dan DeSloover MS (CIMSS)

1996-1997
Jay Heinzelman MS (SSEC)
Phil Politowicz MS (SSEC)

1997-1998
Ben Ho PhD (NASA Langley)
Bormin Huang PhD (CIMSS)
Paul van Delst PhD (CIMSS)
Gideon Kinyodah MS (Kenya Met Office)
Rose Shie MS (computer science)

1998-1999
Mike Friedman PhD (Oregon State)
William Badini MS (private sector)
Jason Dunion MS (NOAA/AOML)
Rhett Drauman MS (NOAA/NWS)
Shaima Nasiri MS (CIMSS)

1999-2000
Erik Olson MS (CIMSS)
Chris Schmidt MS (CIMSS)
Nick Nalli PhD(CIRA)

2000-2001
Nick Bower PhD (from Curtin Univ)
Monica Harkey MS (UW)
Michael Pavlonis MS (CIMSS)
Kurt Brueske PhD (Air Force)

2001-2002
Hong Zhang MS (CIMSS)
Brian Kabat MS (Air Force)
Sarah Thomas MS (CIMSS)

2002-2003
Shaima Nasiri PhD (CIMSS)

2003-2004
Mark Gray MS (GSFC)
Giuklia Pannegrossi PhD (Italy)
Grag McGarragh MS (LaRC)
Remote Sensing Schools catch on around the world
Friends from all over
CIMSS in the next 25 years

* NWP maximizes benefit from remote sensing data
* spatial, temporal, and spectral resolution increases
* ocean studies forge ahead
* reference network establishes climate quality data
  AERIs supplement in situ observations
* imaging and sounding functions merge
  hyperspectral remote sensing matures
* active complements passive remote sensing
* land, ocean, and atmosphere are studied
  fingerprint of climate and climate change emerge
* global partnerships are forged within GEOSS
  pulse of the planet is taken
Clouds will get a thorough look with the A-train
The top opportunities for CIMSS with NOAA and NASA in the coming years?

* to help evolve NOAA remote sensing assets with NPOESS and GOES-R
* to help build a strong research to operations bridge from a revitalized NASA to a multi-applications oriented NOAA
* to help GEOSS realize its potential through open sharing of and strong support from the NOAA & NASA environmental remote sensing capabilities
* to help foster the opportunities for international partnering in the development and demonstration of new remote sensing capabilities (e.g. IGeoLab)
The **top challenges** for CIMSS with NOAA and NASA in the coming years?

* to maintain and increase the gains in environmental remote sensing demonstrated by EOS (e.g. AIRS soundings, MODIS polar winds)
* to sustain a strong viable partnership between government, industry, and university that takes advantages of the unique capabilities of each
* to assure adequate resources and capabilities are directed toward accomplishing the pending climate tasks
CIMSS has flourished because of

→ good leaders leading good people
→ interesting science
  instruments and cal/val
  processing and visualization
  algorithms and applications
  multitudes of data
→ steady sponsorship from NASA and NOAA
  basic research
  transfer to operations
→ strong international partnerships
  global observing system
It has been a great ride – Thank you