REFERENCE UPPER AIR NETWORK

http://www.orbit.nesdis.noaa.gov/smcd/opdb/poes/suan

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HISTORY

NOAA Council on Long-Term Climate Monitoring (Jan., 2003)
*includes specific recommendations for "integrated global observing systems which include reference radiosonde and over-flying satellite observations … "**with goal of accurate, long term monitoring of global temperature and moisture ..."***

Workshop to Improve Usefulness of Radiosondes (March, 2003)
initial candidate SUAN presented, major topics include effectiveness of existing radiosonde sampling strategies and complimentary roles of global radiosondes and polar satellites as transfer standards ...

White Paper: Creating Climate Data Records from NOAA Operational Satellites (August, 2003). (Goldberg and Bates)
Section 4.2.1, Observing System Performance Monitoring (visit ITSC web page: http://cimss.ssec.wisc.edu/itwg/

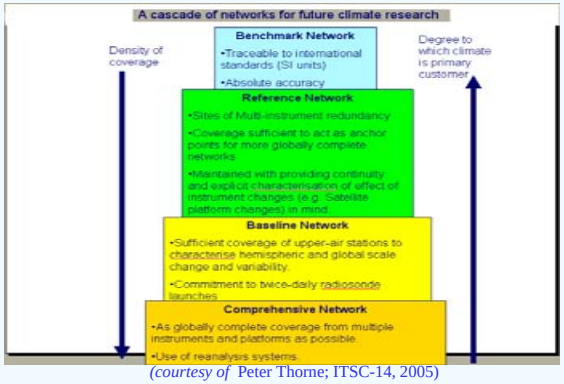
International ATOVS Study Conference (November, 2003)
Recommendation to pursue "SUAN" including document targeted for WMO
http://www.orbit.nesdis.noaa.gov/smcd/opdb/poes/suan

WMO/AOPC (Geneva, April, 2004)
Reference to consist of a subset of GUAN … "Super-sites"
Create WG to address future GUAN design … chaired by Peter Thorne

UKMO Workshop on Vertical Temperature Trends (September, 2004)

NOAA/GCOS Workshops)
(design future upper air observations for climate)

Phase-1 : **Winter 2005 – initial definition of requirements**
Reference Upper Air Network …



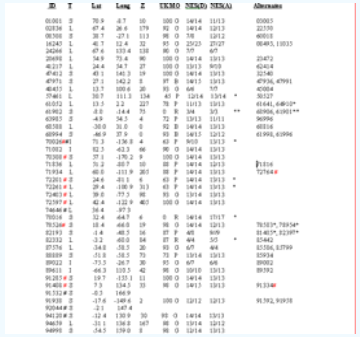
(courtesy of Peter Thorne; ITSC-14, 2005)

Phase-2 : **Summer 2005 - potential networks and deployments to meet requirements**

Phase-3 : **Late 2005 - definition of integrated observing system …**

GEOSS *" system of systems "*

CANDIDATE REFERENCE NETWORK



Selection Criteria

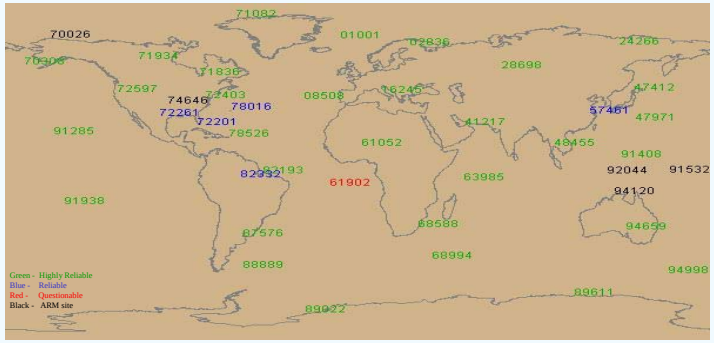
- Subset of *"super-sites"* among GUAN (150) *(WMO/AOPC, Geneva, April, 2004)*
  - Active and Reliable (Green, Blue, Red) *(UKMO, w/McCarthy, NESDIS, w/Tilley)*
  - Global/Robust *(weather and terrain)*
  - Low terrain (500m; 950mb)
  - Non-coastal
- *ARM Sites* (Black)
- *SHIPS !?*

Super-Site

- Standard Reference Sondes
  temperature, *moisture*, wind, cloud
  5 mb
  Instrument type ?
- Traceable In-situ Measurements
  (see ARM) … *site dependent*
- R & D
  radiosonde validation (including non-REFENCE sites)
  radiation and inter-sonde "corrections"
  new technology development (sonde moisture, in-situ …)
  balloon drift and local weather impacts
  dual and sequential launch experiments
  aircraft over / under flights

National science vessels (like NOAA Ronald H Brown) often include automated (ASAP) radiosonde, in-situ measurement (cloud, radiometric, SST) capability … *optimal platform for REFRENCE network!*

http://www.arm.gov/measurements/



How Many Observations

- 42 sites (plus Ships)
  20 Sea
  18 Land
  4 Sea-ice
- *One launch per day! … minimal requirement , staggered among " **operational satellites** " and orbital nodes*
- 2 (or 3) operational (NOAA and METOP ...) satellites:
  15 (or 10) observations per satellite, per site, per month
  over 600 (or 400) observations globally, per satellite, per month
  over 6000 (or 4000) observations globally, per satellite, per year
- ***COST:***
  $ 5 million (… @ $300+ per sonde about $125K per site)
  Reduced cost through re-programming of existing resources

Program Components

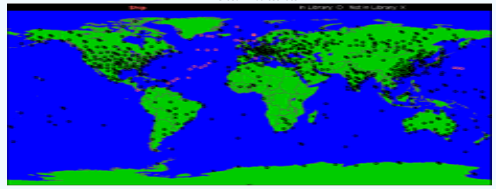
- Generation/Distribution (NESDIS) of Launch Schedules
  (i.e., 45 minutes before overpass)
  Fixed sites
  Ships
- Metadata Records … launch protocols, data corrections, training, etc
- Network Performance Monitoring/Feedback
- **Data Collection (NESDIS) and Archive (NCDC)**
  integrate into NESDIS operational support systems (ATOVS, METOP, NPP, NPOESS)
- Relational Collocation File Structure (satellite, radiosonde, in-situ, etc) (*Francis / Schweiger* – NOAA SEARCH … "correcting the past")
- Flexibility and Expansion
  other satellites (GPS ...)
  in-situ (site dependent)
  platforms (ACARS, Dropsondes, …)
- Accessibility (data, directories, software readers) … Web-based ?

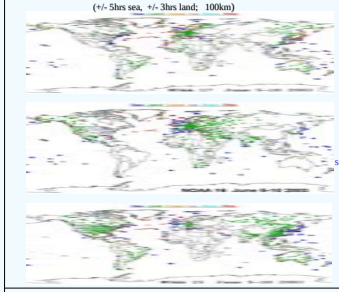
International Coordination (WMO)

Cultivate national commitments to support internationally accessible polar satellite programs
If you use it, support it
International oversight (ITSC …)
Start now ! … stop the waste

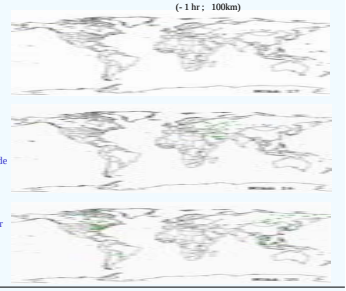
JUSTIFICATIONS

Global Radiosondes

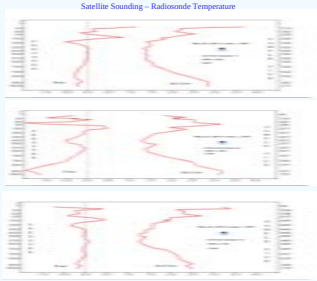




Sampling bias (left) and lack of same-same profiles (right) among available collocations of satellite and radiosonde observations undermines their utility in Climate and Weather

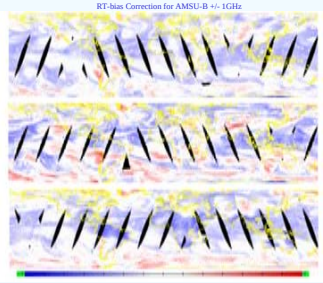


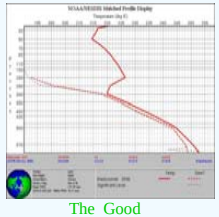
Satellite Sounding – Radiosonde Temperature



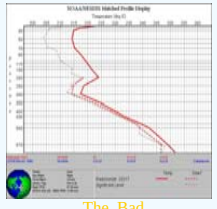
Product Validation (left) and RT- bias correction (right) skewed by systematic sampling and associated measurement errors (per satellite)

RT-bias Correction for AMSU-B +/- 1GHz

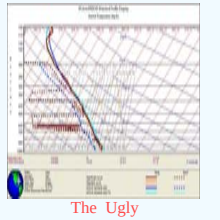




The Good



The Bad



The Ugly

(Ask about our new moisture screening techniques)

- Coordination lacking among current data platforms (satellite, radiosonde, in-situ, field experiments, …)
- Incomplete Meta data records
- Processing errors (need original data …)
- Formatting nightmare
- Lacks traceability (uncertainty unknown)
- Not same-same

THE BOTTOM LINE

- REFERENCE means Stability
- "Long-term" record of critical upper air observations benefits current and future generations … *connecting the dots*
- if it can't be done with a REFERENCE, it can't be done …
- ask yourself, if we had such a database today (i.e., that spanned operational TOVS era-1979), would we better off ?
- ***Positive Impacts on Climate and NWP***