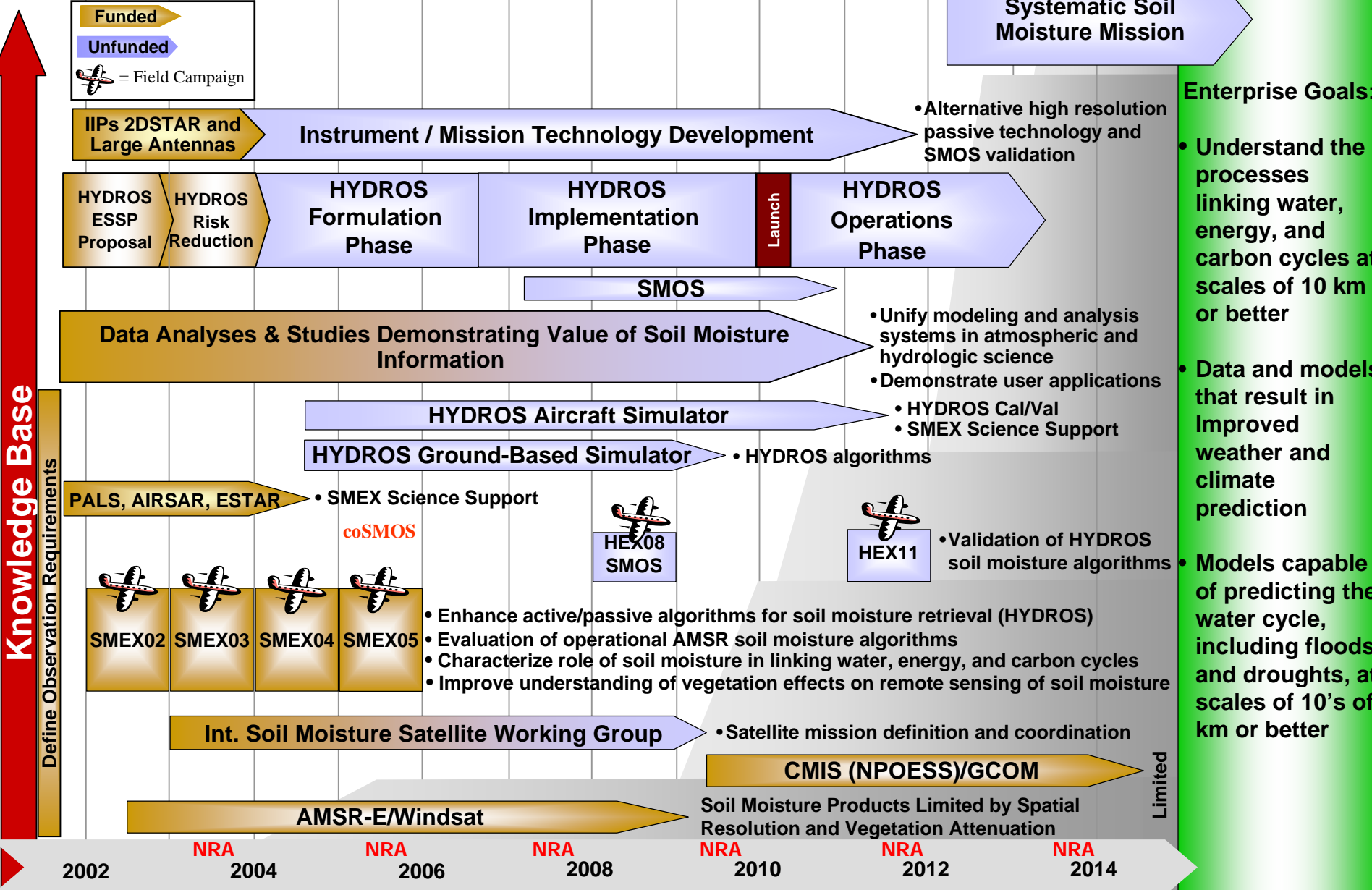


IGWCO Soil Moisture Working Group (ISMWG)

**T. Jackson
March 3, 2005**

Soil Moisture Mission Roadmap



Knowledge Base
Define Observation Requirements

Limited

TODAY:

- Data denial experiments show influential role of soil moisture in severe weather forecasting, in seasonal water cycle predictability, and in linking water, energy, and biogeochemical cycles over land
- Extensive heritage using ground-based and airborne instruments in field experiments which have demonstrated the need for low frequency active and passive microwave remote sensing to accurately map soil moisture fields at relevant scales
- Complete lack of in situ networks and inadequacy of current spaceborne sensors to meet soil moisture mapping requirements

Motivation (ver. 1)

- **Develop a way for SMOS and Hydros to cooperate. Better science and more efficient use of resources.**

Motivation (ver. 2)

- **International cooperation in research and applications supporting soil moisture satellite missions. This provides a link between **current (AMSR) and future missions (SMOS and Hydros)** as well as active and passive. It also extends to CMIS and GCOM. Could help provide interested national groups to justify validation and application activities sponsored by those nations.**

Motivation (ver. 3)

- **Insitu-Remote Sensing-Modeling-Data Assimilation**
- **Leese, J., Jackson, T., Pitman, A., and Dirmeyer, P. GEWEX/BAHC international workshop on soil moisture monitoring, analysis and prediction for hydrometeorological and hydroclimatological applications. Bulletin of the American Meteorological Society, 82:1423-1430. 2001.**



Initiative

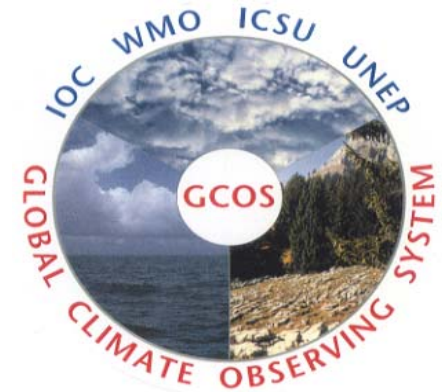
- **Provide a comprehensive framework to harmonize the common interests of the major **space-based and in-situ systems** for global observation of the Earth**
- **IGOS strives to build upon the strategies of existing international global observing programs, and upon current achievements.**
- **It seeks to improve observing capacity and deliver observations in a cost-effective and timely fashion.**
- **Additional efforts will be directed to those areas where satisfactory international arrangements and structures do not currently exist.**



Water Cycle Theme: Soil Moisture Recommendations

- A coordinated plan for **soil moisture networks** should be developed first at the national and then at the international levels.
- The capabilities to measure soil moisture from space have been demonstrated, but **committed missions** are needed to perfect these measurements and to determine the utility of soil moisture measurements derived from space.
- The relationships between **surface soil wetness and deep soil moisture** profiles needs to be quantified or at least understood.
- Vegetation cover can obscure the radiation arising from warm wet soils. Research is needed to find better ways of **removing the vegetation effect** from the signal that is being used to derive soil moisture.
- A **supersite program** is needed to provide the comprehensive data sets needed for sensor evaluation and calibration, and to provide a basis for developing soil wetness algorithms for satellite measurements and the evaluation of climate model outputs.

An Emerging Set of Focus Areas Aligned with The Global Climate Observing System (GCOS) Implementation Plan



- **Recognizes soil moisture as an emerging climate variable**
- **Commits to a global network of in-situ soil moisture measurements**
- **Commits to developing a quasi-operational soil moisture data product**

ISMWG

- **Required Actions**

- Developing global soil moisture information requires contributions from *in situ* measurements, satellite observations, and a reliable data assimilation framework. To obtain improved soil moisture information, it will be necessary to **enhance both *in situ* sites and satellite data. This will involve network enhancement by expansion and standardization, dedicated soil moisture missions, and improved coordination of soil moisture data network planning, observing standards, and data exchange.**

ISMWG

- **Activities**

- **IGWCO is addressing this issue through its Soil Moisture Working Group which is developing mechanisms for cooperation between national groups and individual scientists that will enhance global soil moisture observation.**

Participation and Needs of the ISMWG

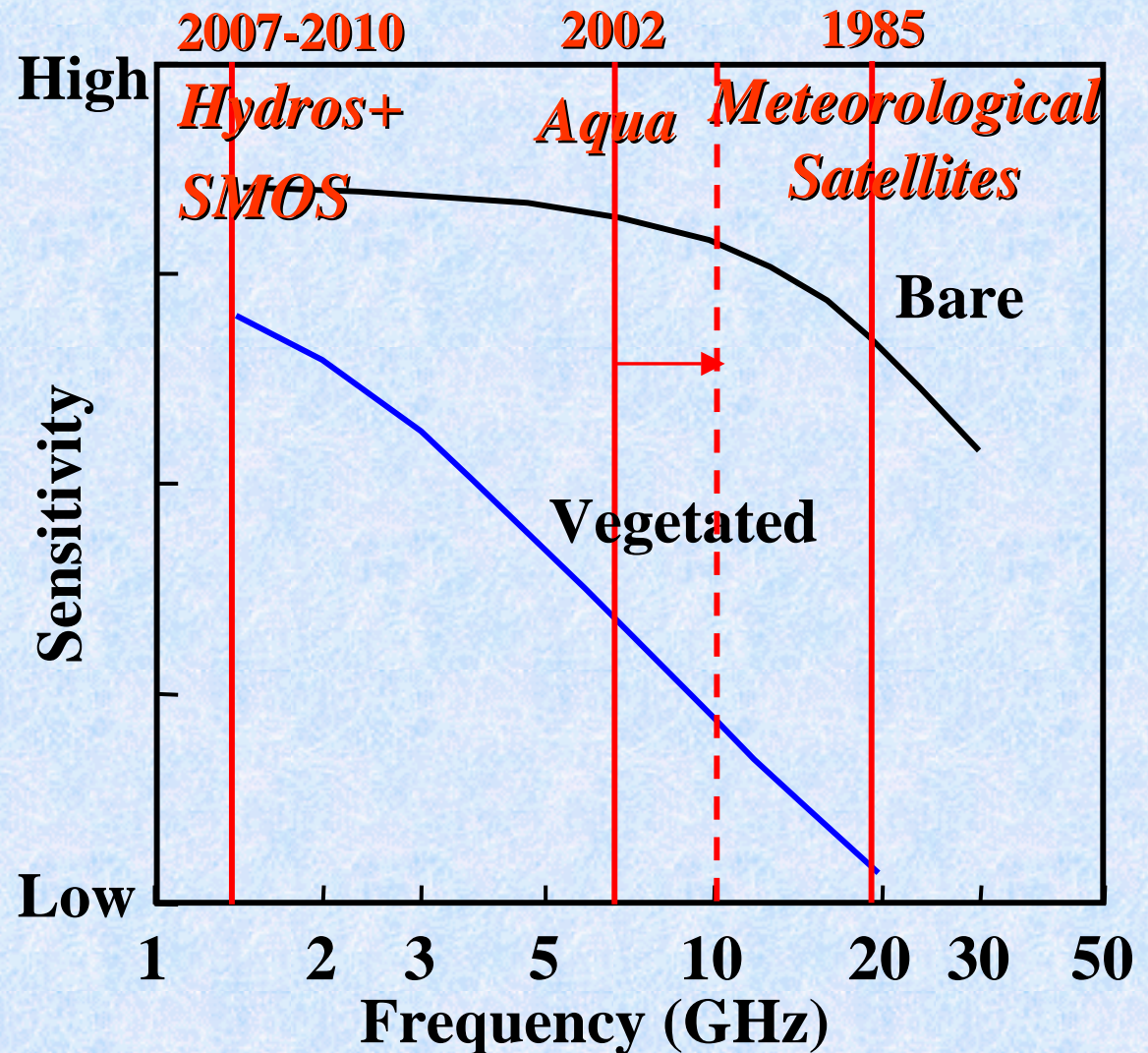
- **Global participation: identify key people and organizations worldwide**
- **Leadership from established programs (insitu and satellite)**
- **Definition of achievable goals (insitu networks, satellite products)**
- **Identify resources to enhance insitu expansion and contributions to satellite/model validation**

What Needs to Be Done?

- **Commits to a global network of in-situ soil moisture measurements (Lead international agency, coordination-workshop?, standards, \$)**
- **Commits to developing a quasi-operational soil moisture data product (Quality and relevance of current products, white paper, international support for planned dedicated missions)**

Global Soil Moisture Monitoring Today and Tomorrow

- Limited by using non-optimal satellites developed for other applications
- A low frequency instrument is needed

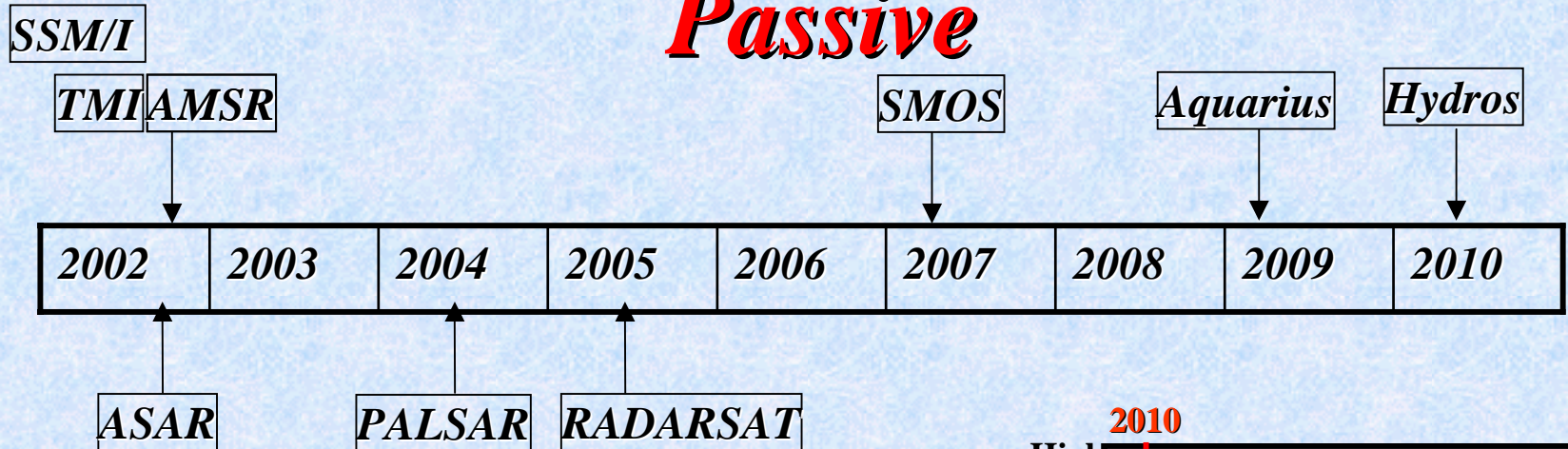


Current Satellite Based Soil Moisture Products

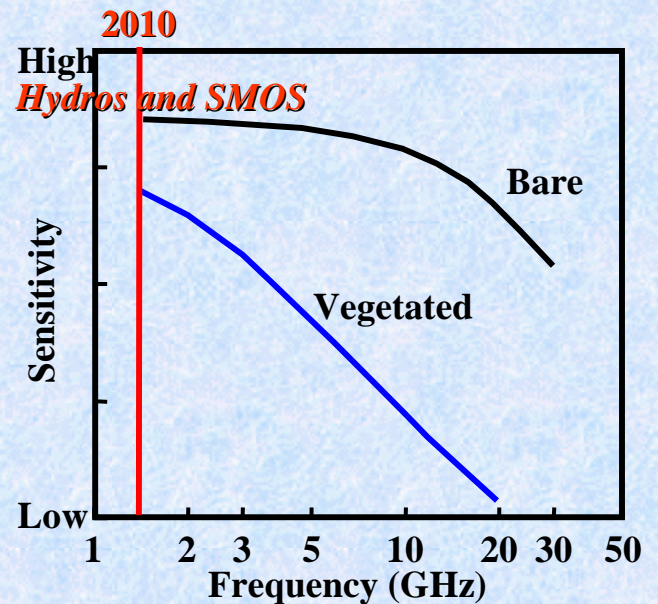
- **NOAA Extreme Events**
- **NASA Aqua AMSR-E**
- **JAXA Aqua AMSR-E (4 algorithms)**
- **AMSR-E soil moisture quality
evaluations have been hampered by
instrument calibration issues and RFI**

Microwave Satellite Timeline

Passive



Active



Insitu Soil Moisture Networks

Dimensions to Consider

- **Extent of network**
- **Density**
- **Frequency of measurement**
- **Latency**
- **Availability**
- **Measurement Technique**

Selected Soil Moisture Networks

