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**ITU Symposium on ICTs,  
the Environment and Climate Change**  
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# **Radiocommunication to monitor climate changes**

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*Committed to connecting the world*

# ***UN and Earth monitoring***

- “United Nations agencies have acknowledged the importance of spacebased technologies for monitoring the Earth’s climate system” (B.Ki-Moon, UN SecGen)
- WSIS action plan: Establish monitoring systems, using ICTs, to forecast and monitor the impact of natural and man-made disasters.





# Radiocommunication Services and Remote Sensing (1)

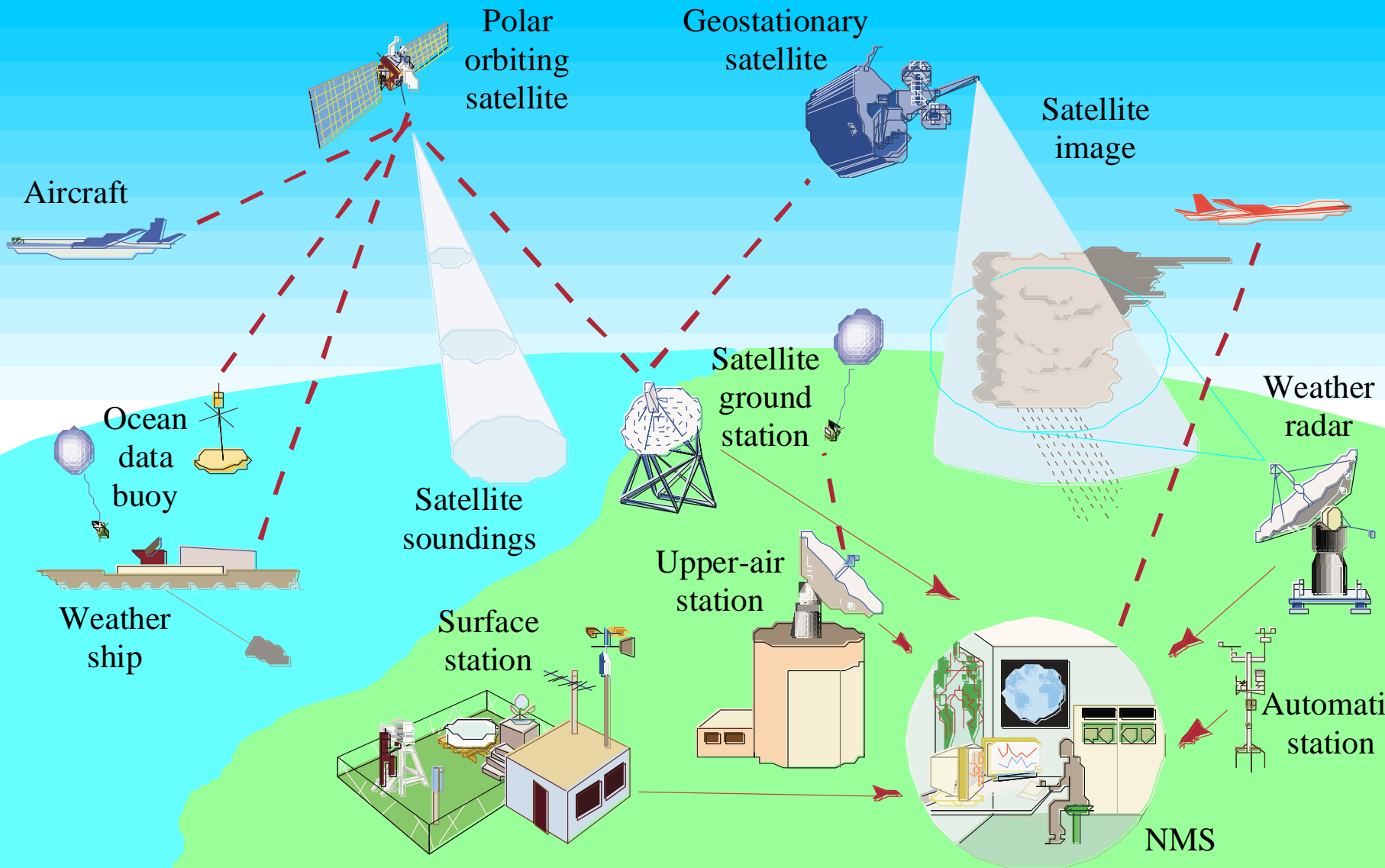
- Remote sensors are the only tools that provide environmental data on a long term, repetitive and **GLOBAL** scale
- Radiocommunication systems based on remote sensing play the major role in weather and climate prediction
- Remote sensing is the essential tool for disaster prediction, detection, disaster mitigation and planning of relief operations
- Sensors are used for detection and tracking of earthquakes, tsunamis hurricanes, typhoons, floods, fires, oil leaks, dangerous pollution, etc.



# Radiocommunication Services and Remote Sensing (2)

- Remote sensors are the basis of meteorological and Earth exploration-satellite services
- Operated in the main by governments and international agencies (NASA, ESA, CNES, ISRO, NOAA, METEOSAT, etc)
- Data collected by active and passive sensors are distributed worldwide in the *Global Observing System* (GOS) and used to benefit humanity as a whole

# Global Observing System



- **Most people know that Meteorology and Earth observations are important ...**

**... but they are much less aware that these activities are fully dependent on radio-frequencies**

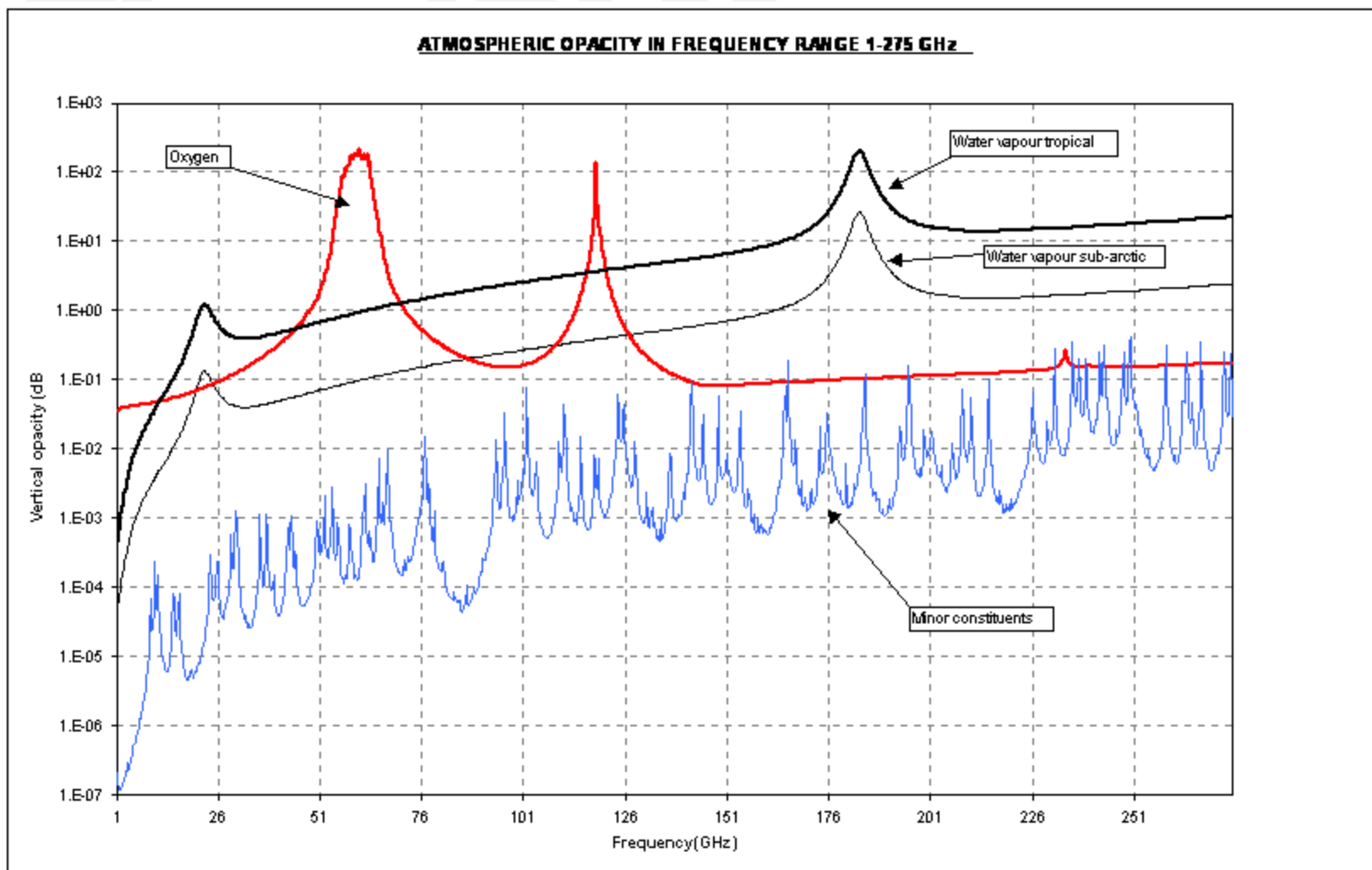
***"No spectrum, no global observations!"***

**(ITU Statement in a side event during Cancun UNFCCC)**

# Radio Regulations and Sensors

- **No. 1.182 *active sensor***: A measuring instrument in the *earth exploration-satellite service (EESS)* or in the *space research service* by means of which information is obtained by **transmission and reception** of *radio waves*.
- **No. 1.183 *passive sensor***: A measuring instrument in the *earth exploration-satellite service* or in the *space research service* by means of which information is obtained by **reception** of *radio waves of natural origin*.
  - **Article 1 of the Radio Regulations**

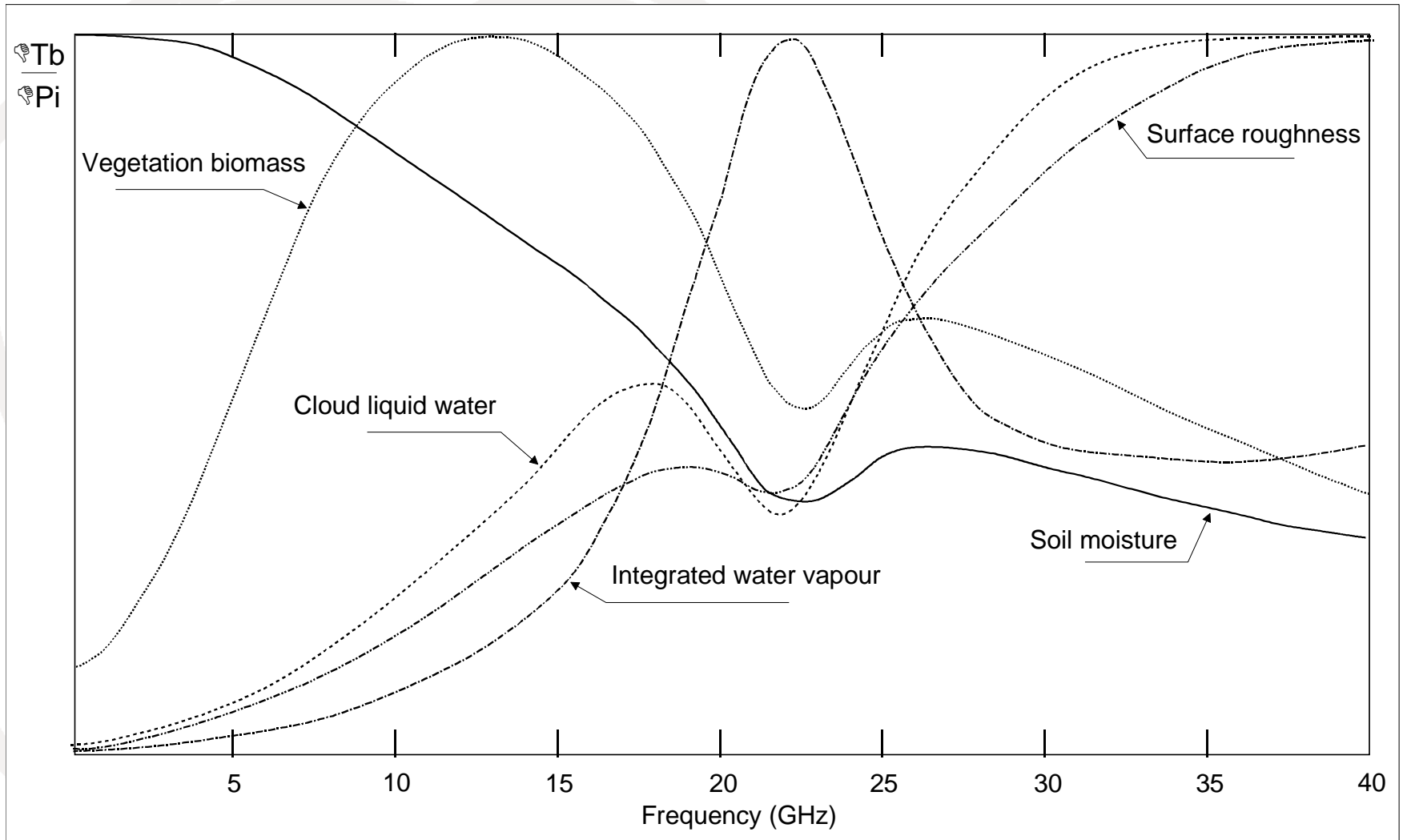
# Passive Sensors observe through the atmosphere



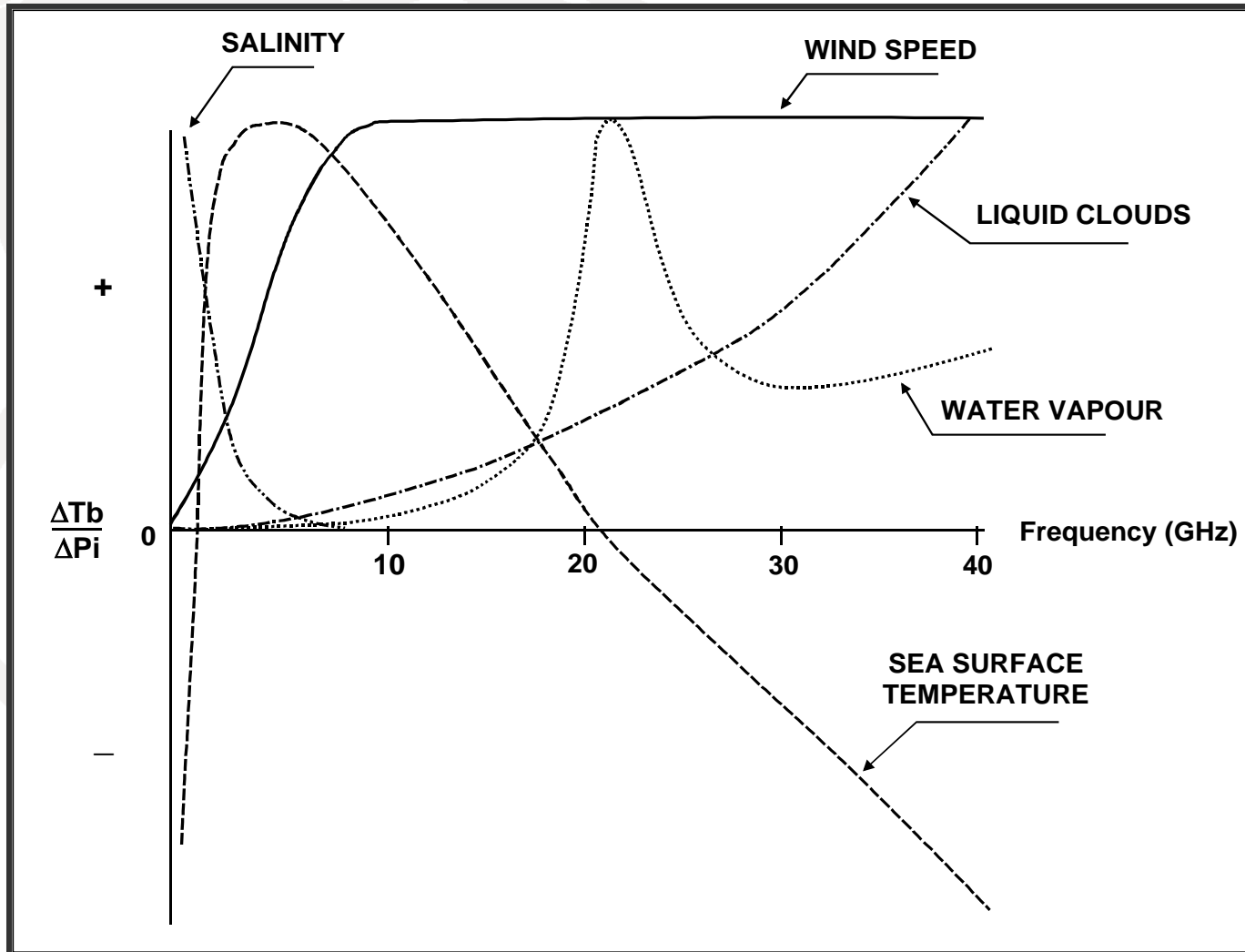




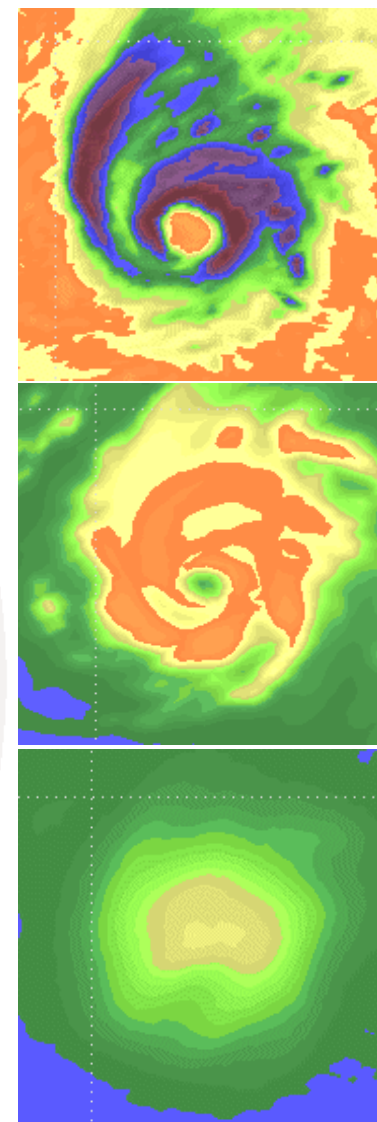
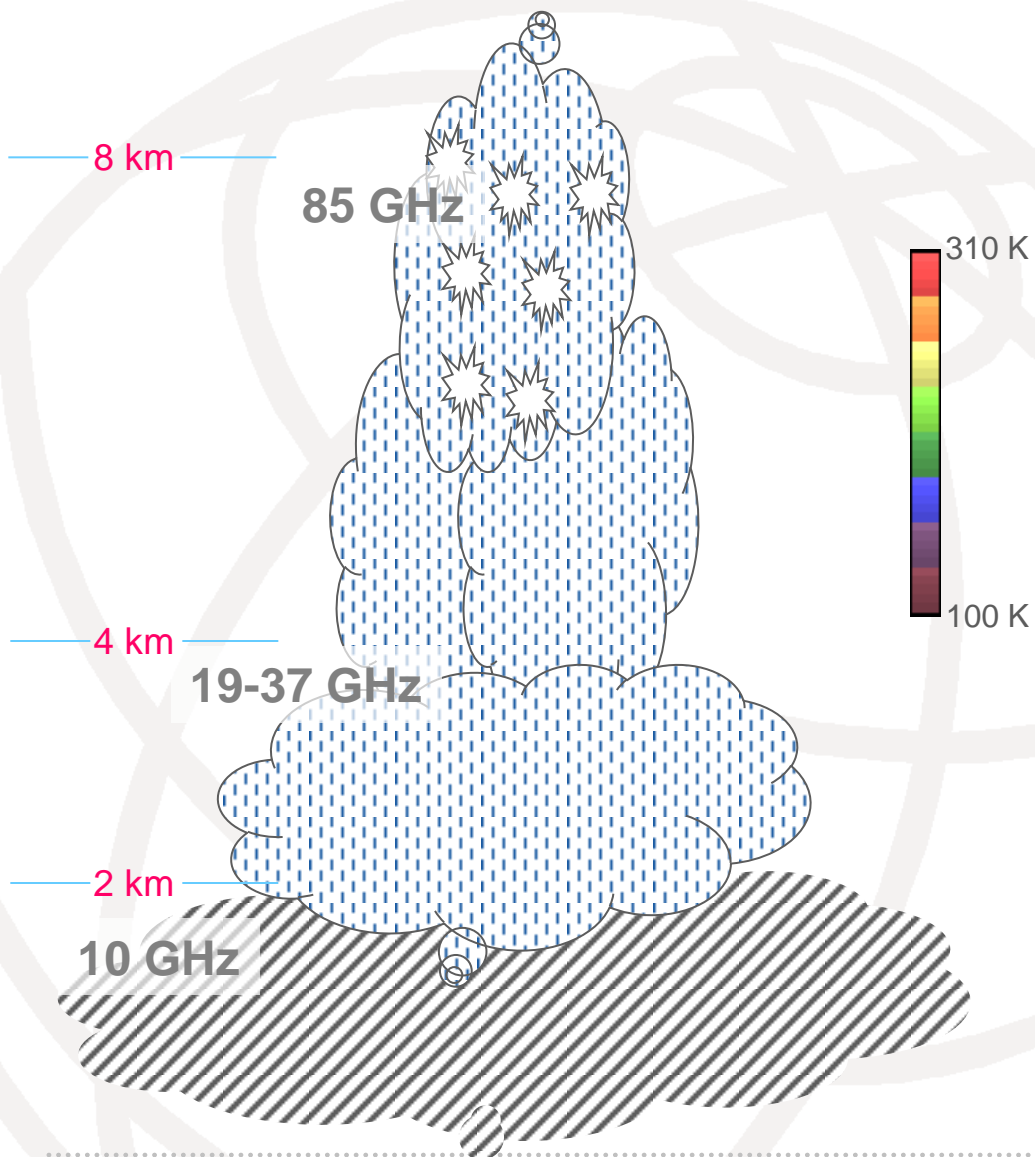
# Microwave Spectrum Spectral Sensitivity to Environmental Parameters: **Land Surface**



# Microwave Spectrum Spectral Sensitivity to Environmental Parameters: **Ocean Scene**

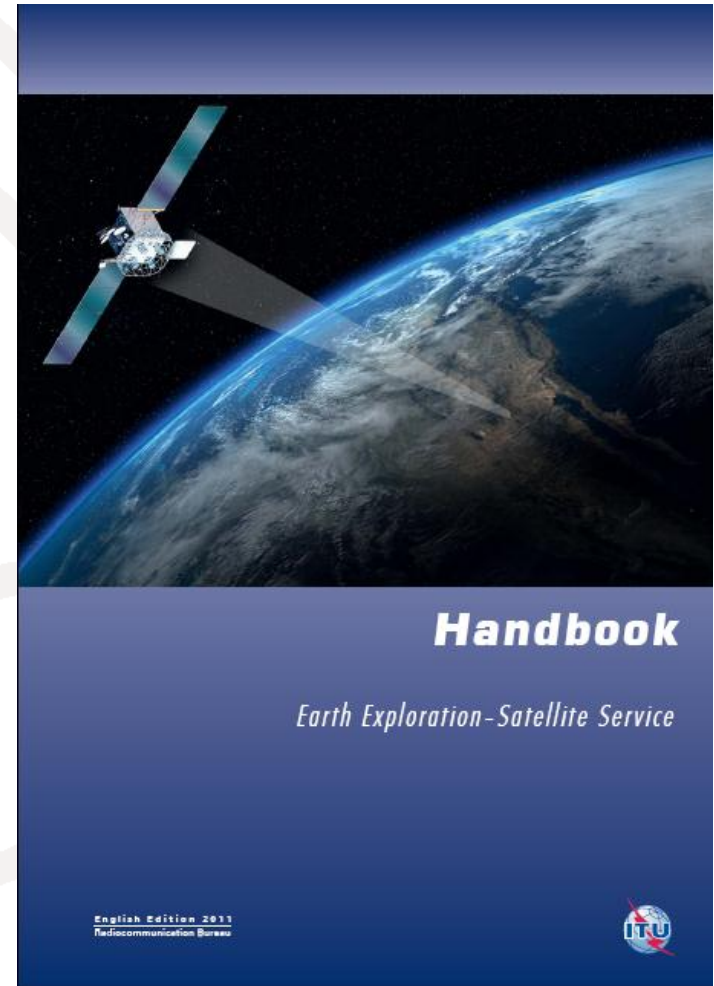


# Sensitivity of different frequencies to Tropical Cyclone Rain



# Technical aspects of Earth observation

- Development of EESS systems.
- Basic definitions, technical principles and applications
- To assist States in spectrum planning, engineering and deployment aspects





## **EESS info 1**

- **WP 7C** of ITU-R Study Group 7 is responsible for studies related to Remote Sensing systems **including EESS** - more info at: <http://www.itu.int/ITU-R/>
  - Studies on the **EESS** are very active
  - **Sharing** and **protection criteria** have been intensively investigated for existing spectrum allocation for **EESS**
  - Studies are also on-going for newly allocated bands (results of WRC-12) for future enhancements and newly planned **EESS** systems, addressing **frequency sharing with other services**
  - These studies contribute not only to the development of **ITU-R RS Series Recommendations** but also to WRC-15 preparation



## **EESS info 2**

- ***Some examples of ITU-R Recommendations and ITU-R Handbook related to EESS***
  - **Handbook on EESS – ITU-R HDB-56**
  - **RS.515** - Frequency bands and bandwidths used for satellite passive sensing
  - **RS.577** - Frequency bands and required bandwidths used for spaceborne active sensors operating in the EESS (active) and space research (active) services
  - **RS.1883** - Use of remote sensing systems in the study of climate change and the effects thereof
    - ***FREE online access to current ITU-R Recommendations until further notice at:***  
<http://www.itu.int/rec/REC-RS/en>



## ***Conclusions***

- **ITU** is committed to working with other organizations in combating climate change
- Earth observations totally rely on **radio-frequencies** to be harmonised and protected
- Earth observation value *can not be measured only in financial terms*, as it prevents large losses of lives or promotes sustainable development in a global scale.



# Radiocommunications to monitor climate changes

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***Questions ?***