

THE WEATHER SATELLITE REVOLUTION

(RECOLLECTIONS OF THE 50-YEAR
TRANSFORMATION OF METEOROLOGY IN THE ASIA-
PACIFIC REGION)

John W Zillman

- **Meteorology before satellites**
- **World Weather Watch and GARP**
- **Meteorology transformed**

**4th Asia-Oceania Meteorological Satellite Users' Conference,
Melbourne, 9-11 October 2013**

BIRTH OF THE INTERNATIONAL METEOROLOGICAL ORGANIZATION (IMO) (Vienna, 1873)

FIRST INTERNATIONAL METEOROLOGICAL CONGRESS

- **Vienna, 2-16 September 1873**
- **32 representatives of
20 governments**
- **Standardization of observations
and data exchange**
- **Establishment of a Permanent Committee**
- **Election of a President**

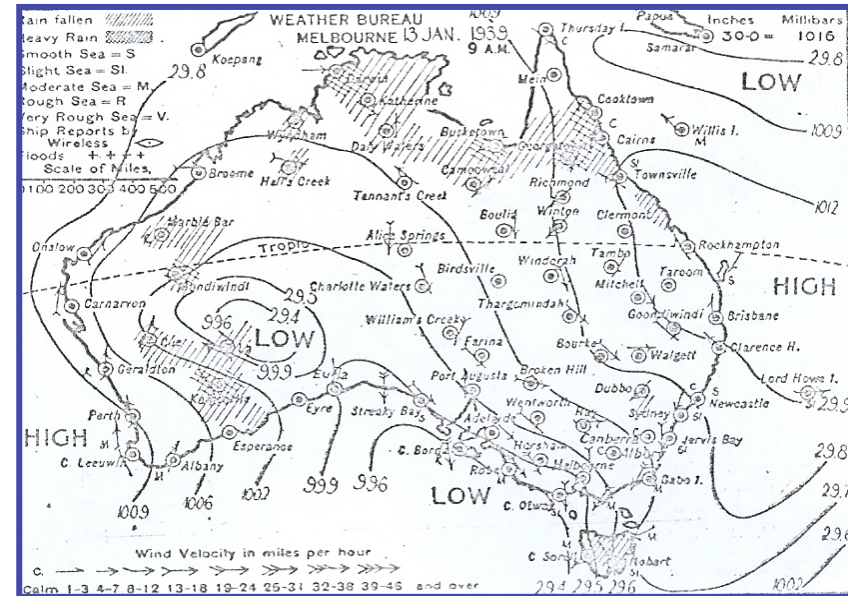


**Professor C. H. D. Buys Ballot,
President of IMO 1873-1879**

AUSTRALIAN SYNOPTIC METEOROLOGY IN THE IMO ERA (1873 - 1950)

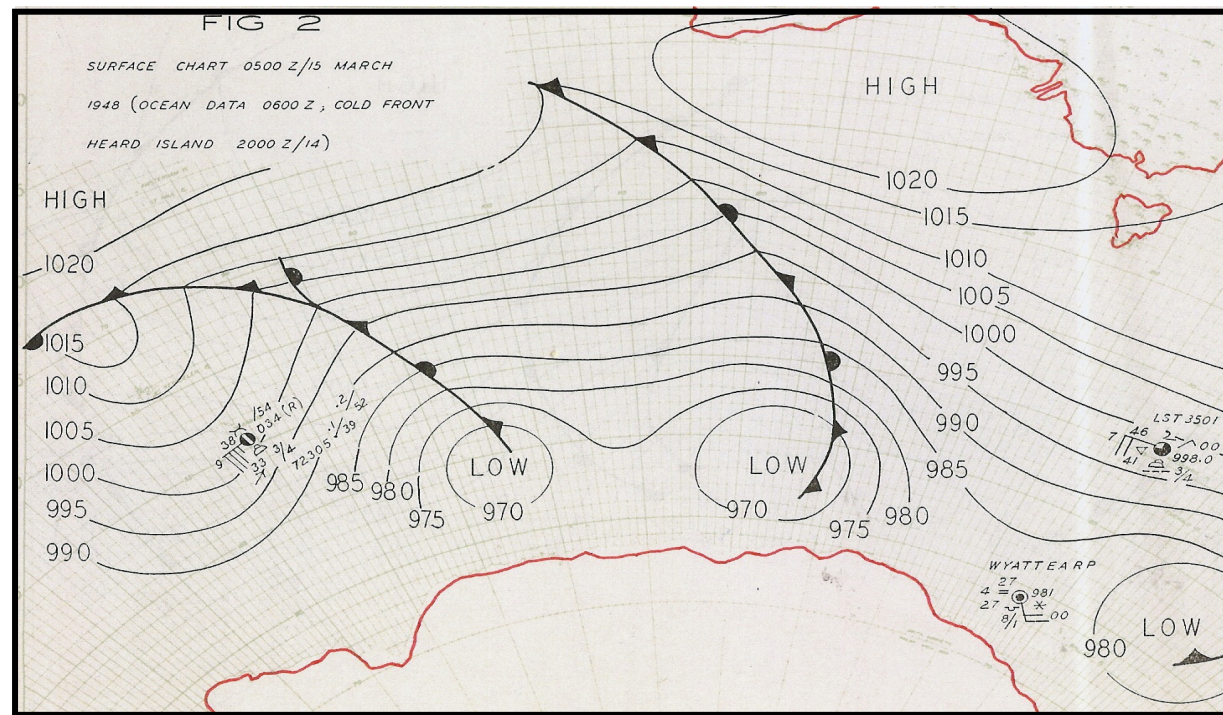


January 2 1908



January 13 1939

SOUTHERN OCEAN ANALYSIS IN THE 1940s



SIGNING THE CONVENTION OF THE WORLD METEOROLOGICAL ORGANIZATION

(Washington DC, 11 October 1947)



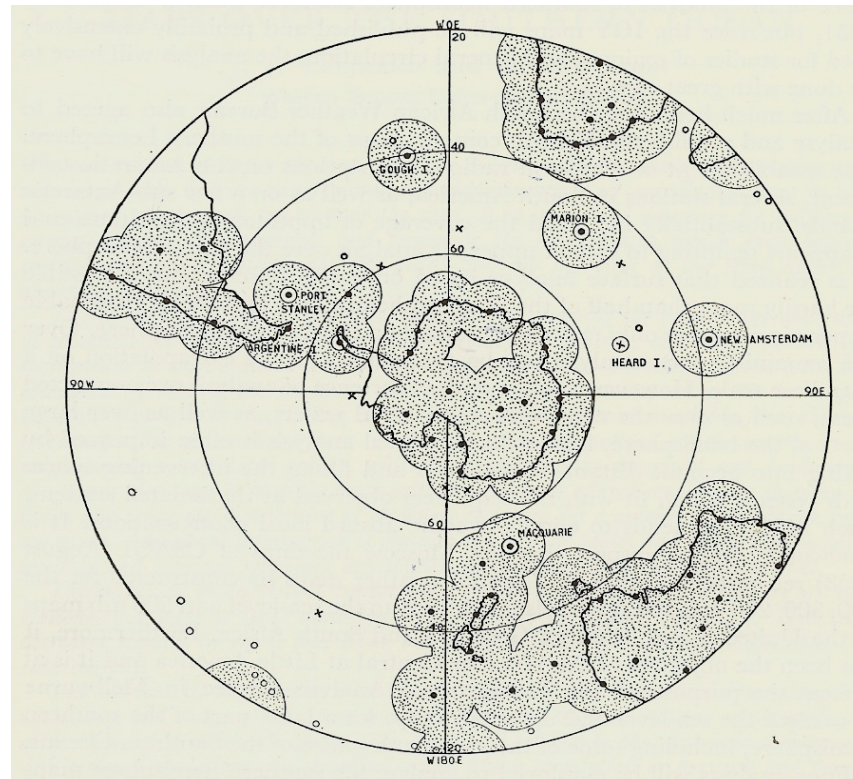
Sir Nelson Johnson (UK), Dr Francis Reichelderfer (US), Mr Norman Warren (Australia)

THE PURPOSES OF THE WORLD METEOROLOGICAL ORGANIZATION (WMO)

- (a) To facilitate world-wide cooperation in the establishment of networks of stations for the making of **meteorological observations** or (as well as hydrological and) other geophysical observations related to meteorology and to promote the establishment and maintenance of meteorological centres charged with the provision of meteorological (and related) services.
- (b) To promote the establishment and maintenance of systems for the **rapid exchange of weather (meteorological and related) information**
- (c) To promote **standardisation of meteorological (meteorological and related) observations and to ensure the uniform publication of observations and statistics.**
- (d)
- (e)

(Convention of the World Meteorological Organization 1950 (as subsequently amended))

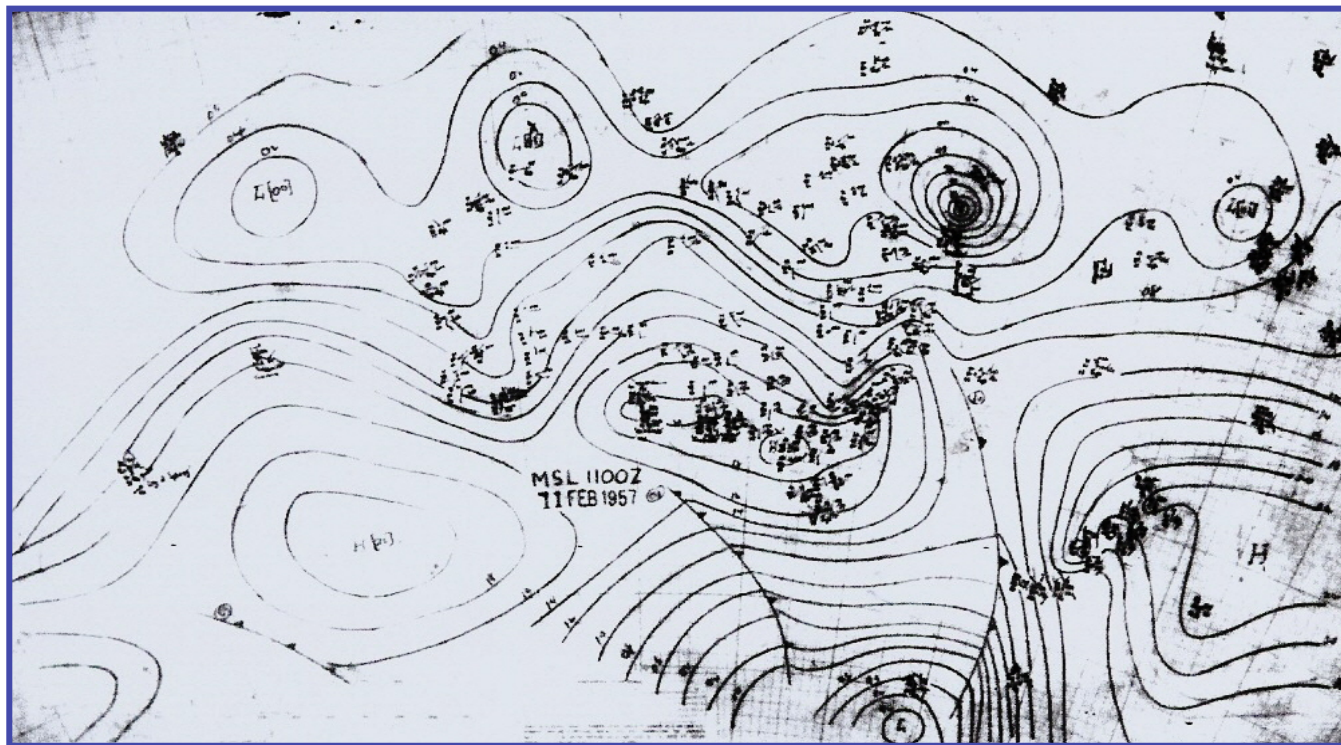
SOUTHERN HEMISPHERE RADIOSONDE NETWORK FOR THE 1957-58 INTERNATIONAL GEOPHYSICAL YEAR (IGY)



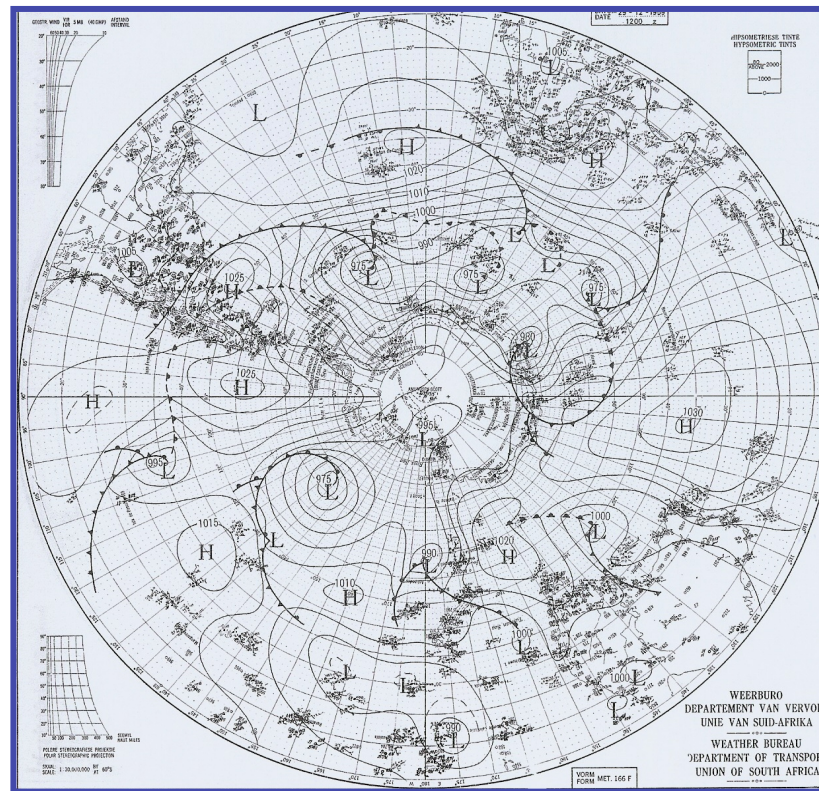
THE 1950s WEXLER VISION FOR CLOUD OBSERVATION FROM SPACE



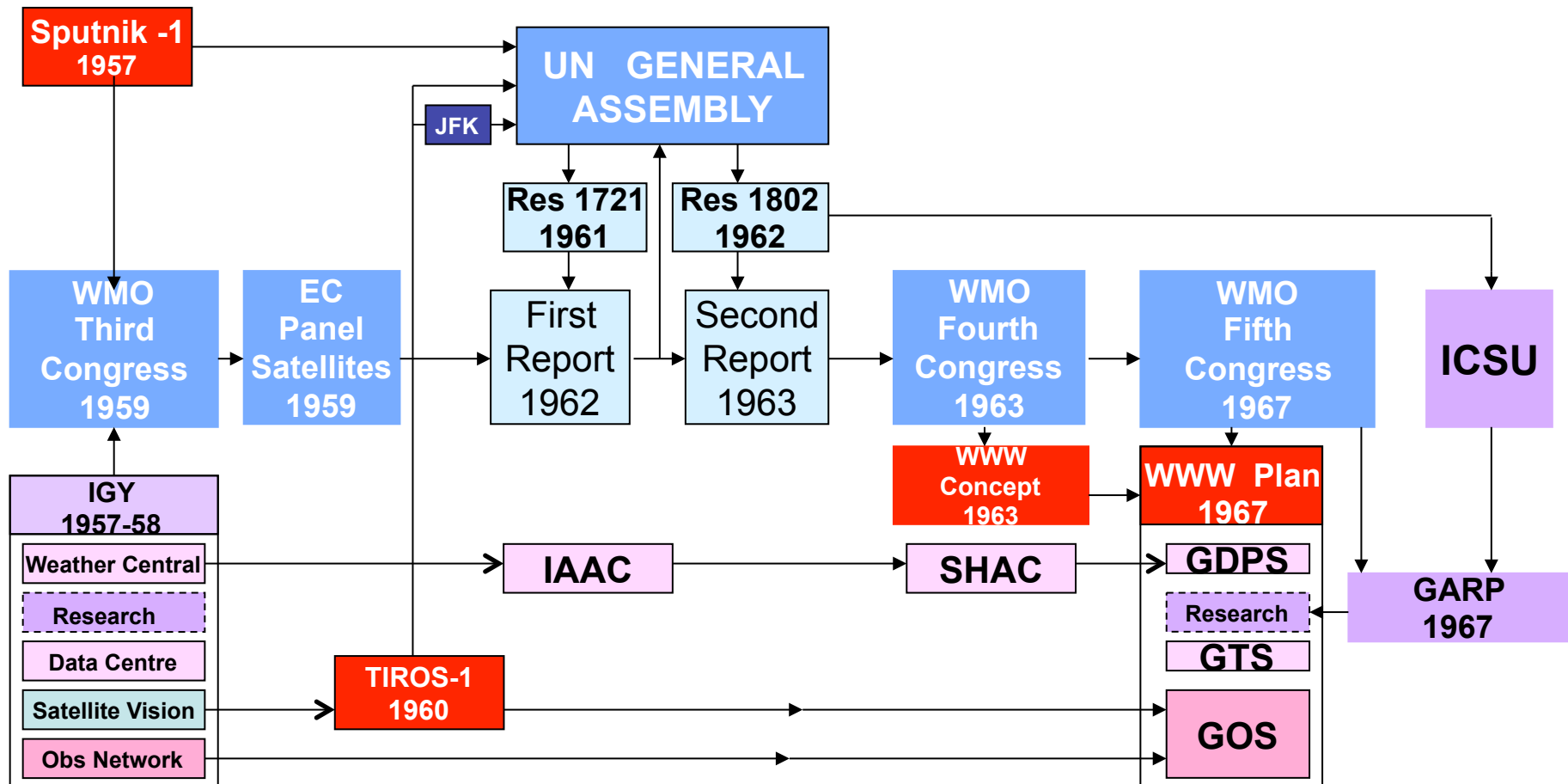
AUSTRALIAN REGION - FEBRUARY 11 1957



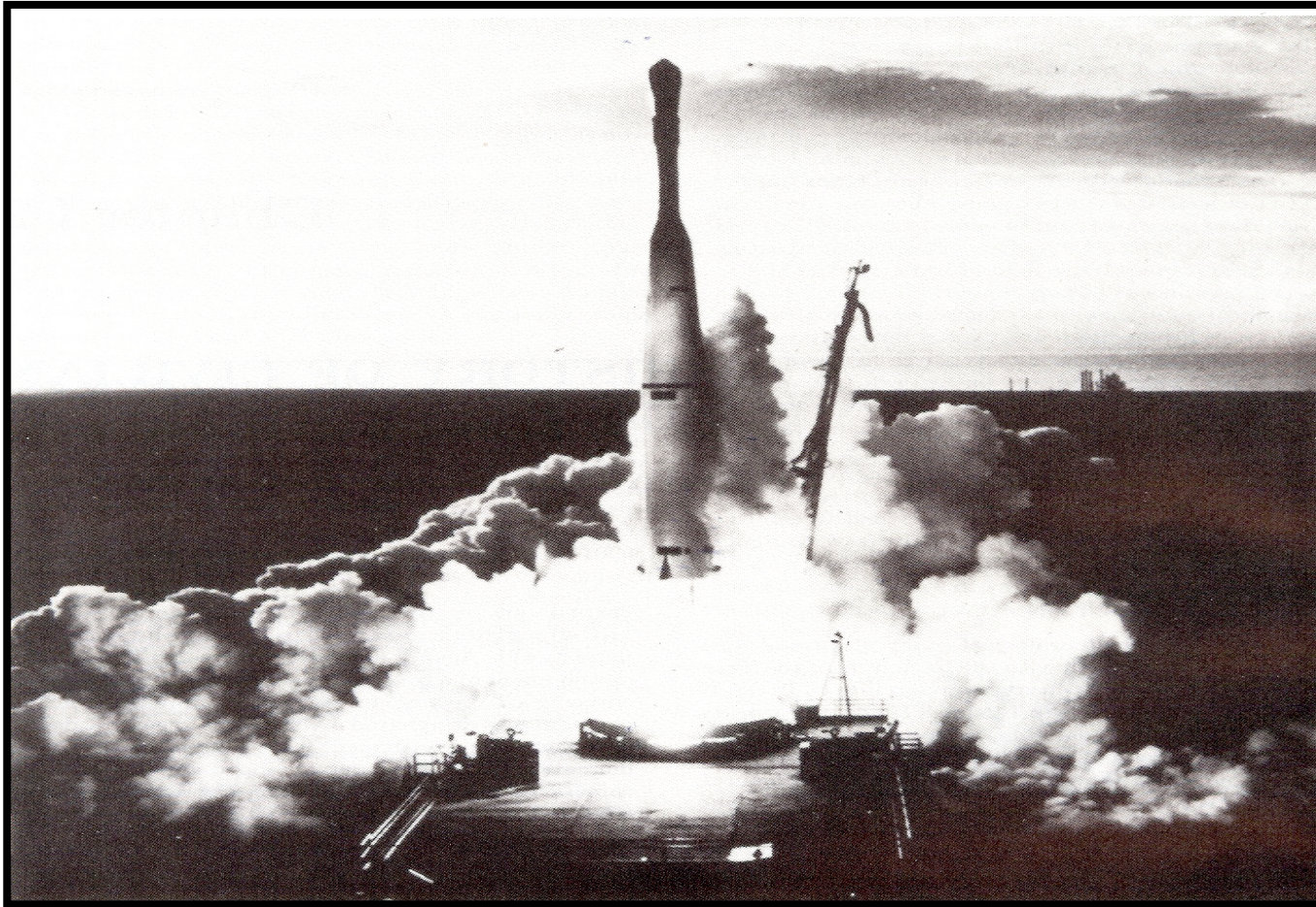
POST - IGY (1959) ANALYSIS FOR THE SOUTHERN HEMISPHERE



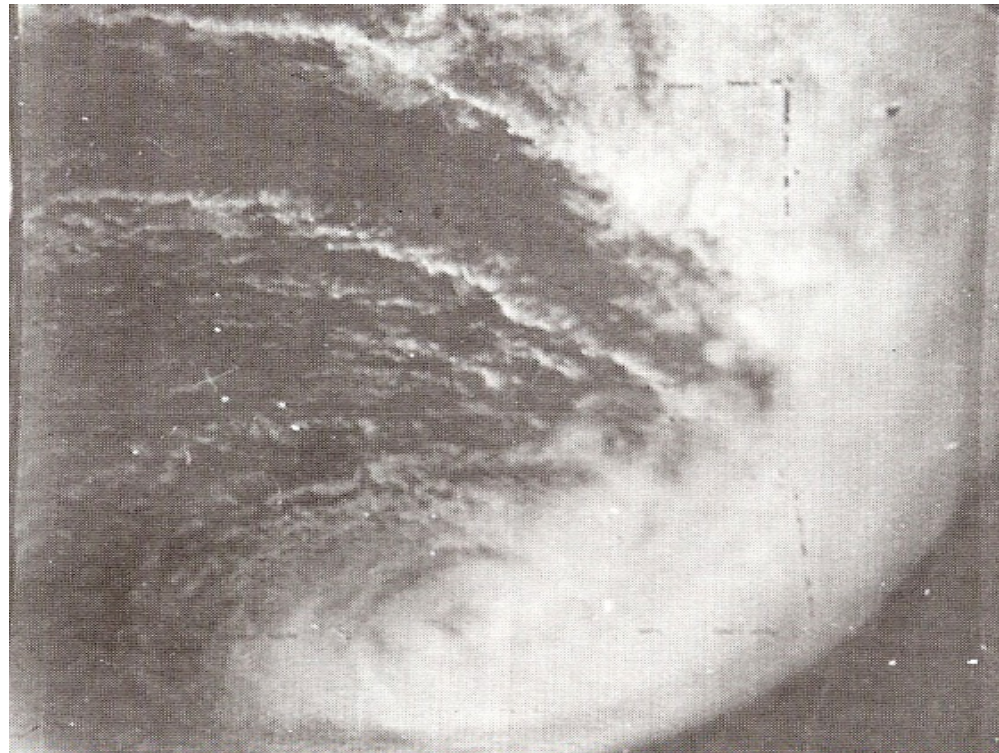
ORIGIN OF WORLD WEATHER WATCH AND GARP



LAUNCH OF TIROS-1 ON 1 APRIL 1960



FIRST VIEW OF A TROPICAL CYCLONE FROM SPACE
300 nautical miles north of New Zealand
(TIROS-1, 10 April 1960)



US PRESIDENT J. F. KENNEDY ADDRESS TO UNITED NATIONS GENERAL ASSEMBLY

(September 1961)



“With modern computers, rockets and satellites, the time is ripe to harness a variety of disciplines for a concerted attack the atmospheric sciences require world-wide observation and, hence, international cooperation We shall propose further cooperative efforts between all nations in weather prediction We shall propose, finally, **a global system of satellites** linking the whole world”

GENERAL ASSEMBLY RESOLUTION 1721 (XVI)

(20 December 1961)

The General Assembly:

Noting with gratification the marked progress for meteorological science and technology opened up by the advances in outer space,

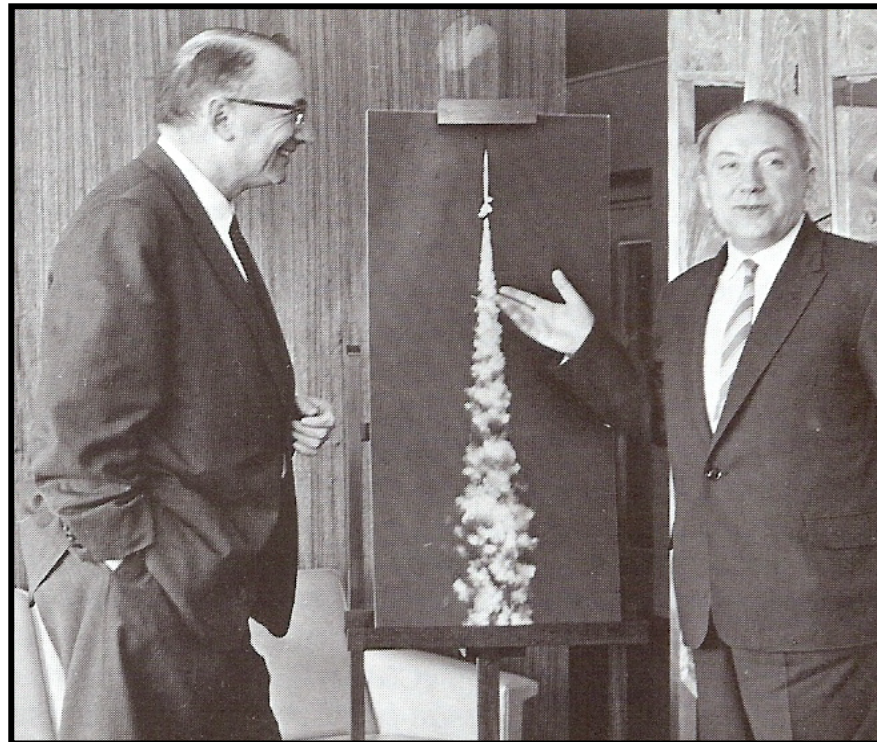
Convinced of the world-wide benefits to be derived from international co-operation in weather research and analysis,

1. Recommends to all Member States and to the World Meteorological Organization... the early and comprehensive study, in the light of developments in outer space, of measures:

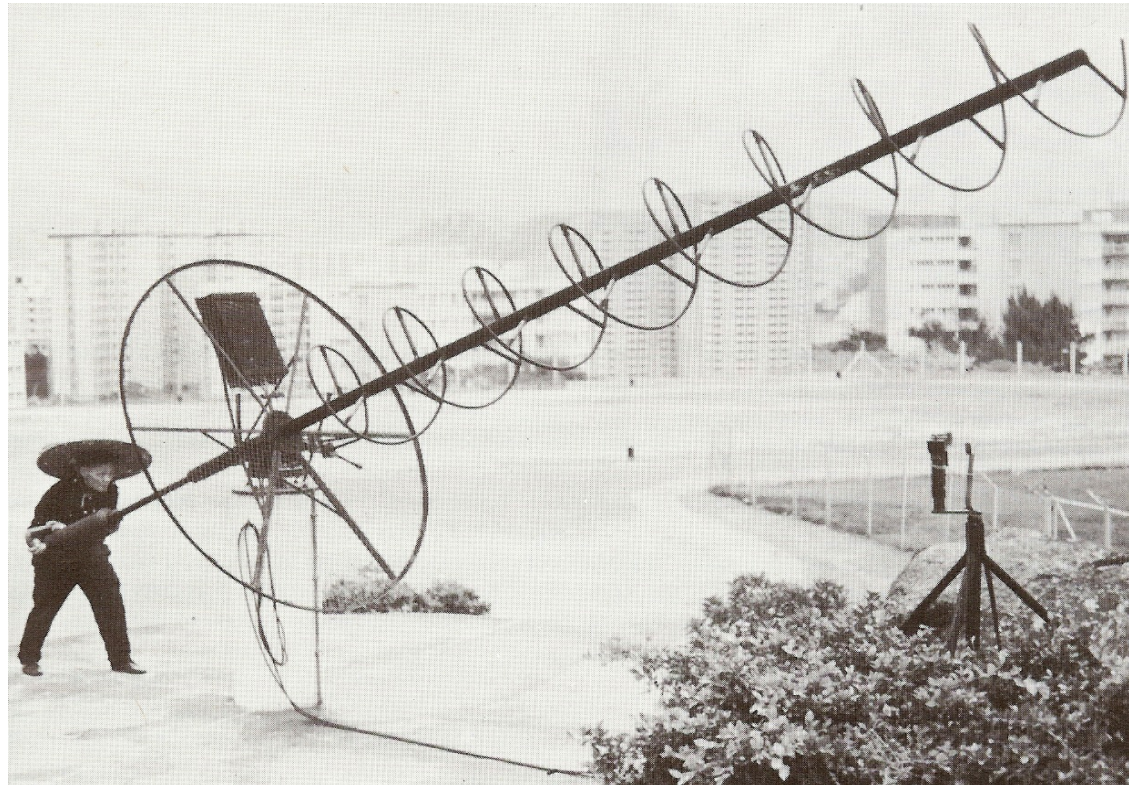
- (a)** to advance the state of atmospheric science and technology so as to provide greater knowledge of basic physical forces affecting climate....;
- (b)** to develop existing weather forecasting capabilities and to help member States make effective use of such capabilities through regional meteorological centres;

2. Requests the WMO, consulting with UNESCO and other specialised agencies and governmental and non-governmental organizations, such as ICSU, to submit a report to its member Governments and to the Economic and Social Council....regarding appropriate organizational and financial arrangements to achieve these ends.....

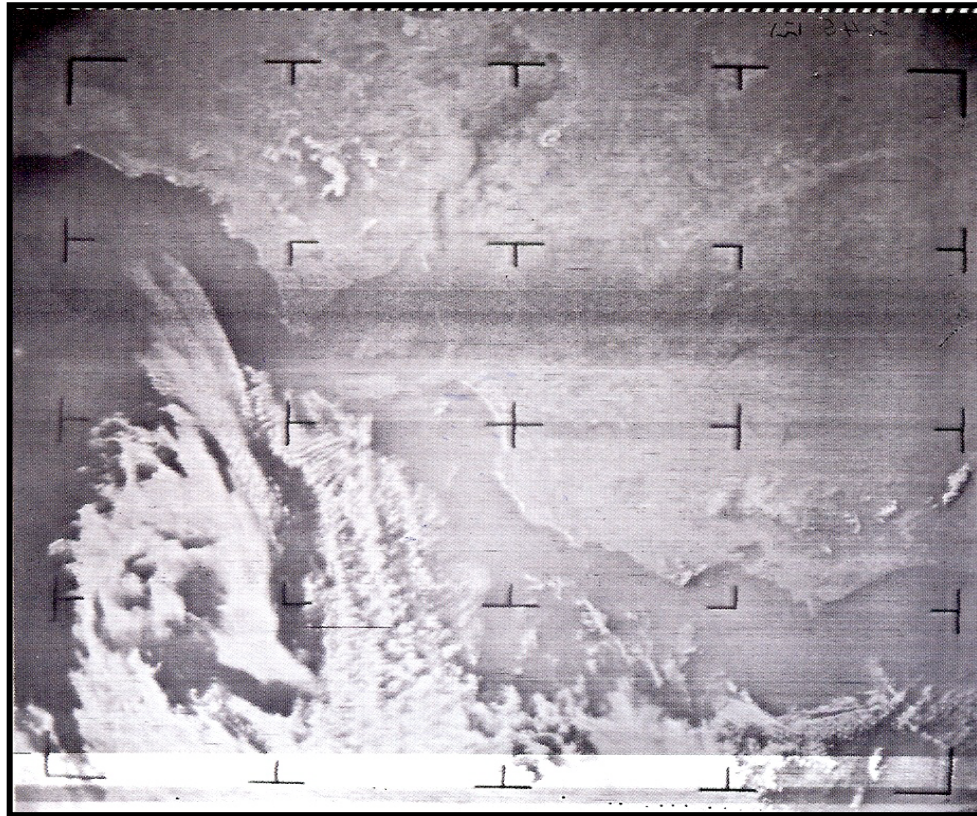
**RESPONDING TO THE UN: WEXLER-BUGAEV
AND THE ORIGIN OF WORLD WEATHER WATCH
(Geneva, 1962)**



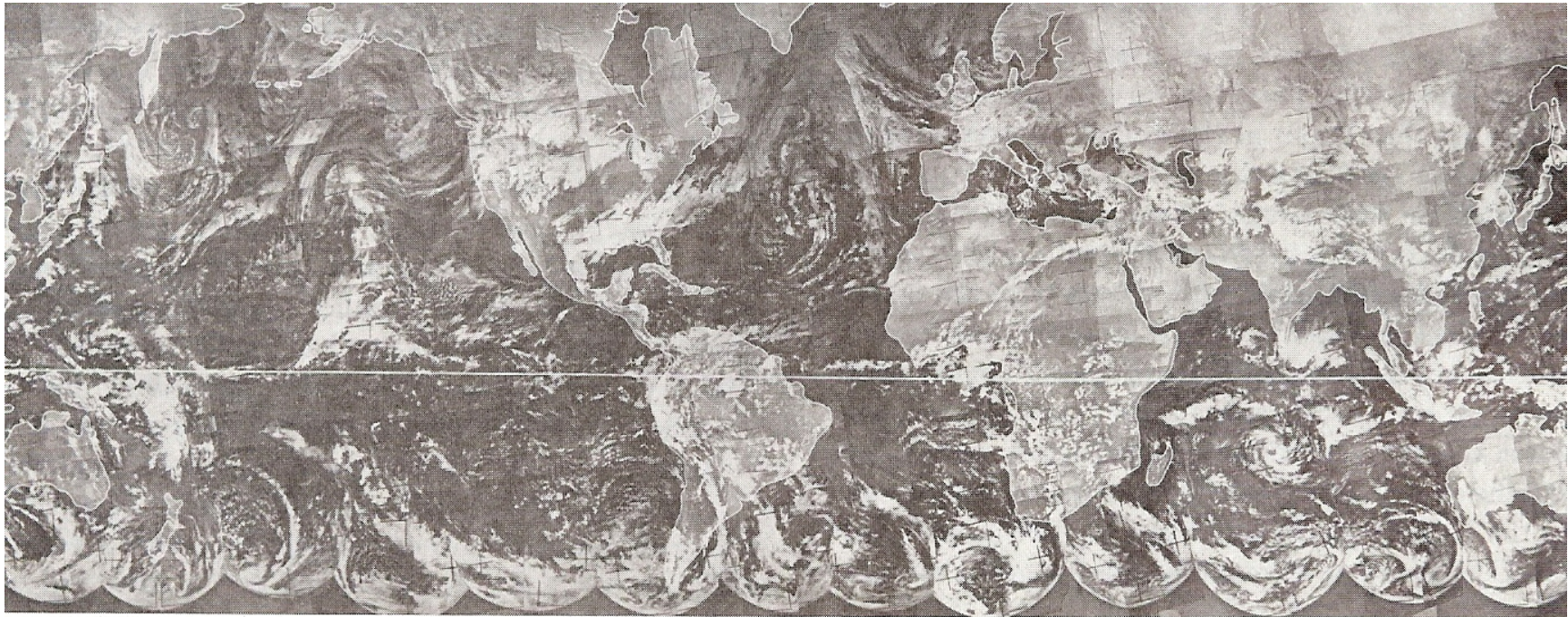
**SATELLITE PICTURES FOR ALL:
(Early Automatic Picture Transmission (APT)
Reception in Hong Kong)**



**ONE OF THE FIRST AUSTRALIAN APT IMAGES
FROM THE NIMBUS I WEATHER SATELLITE (1964)**



FIRST GLOBAL CLOUD MOSAIC FROM TIROS-9 (1965)



THE CONCEPT OF WORLD WEATHER WATCH (E K Federov, 1966)



**Academician
E K Federov**

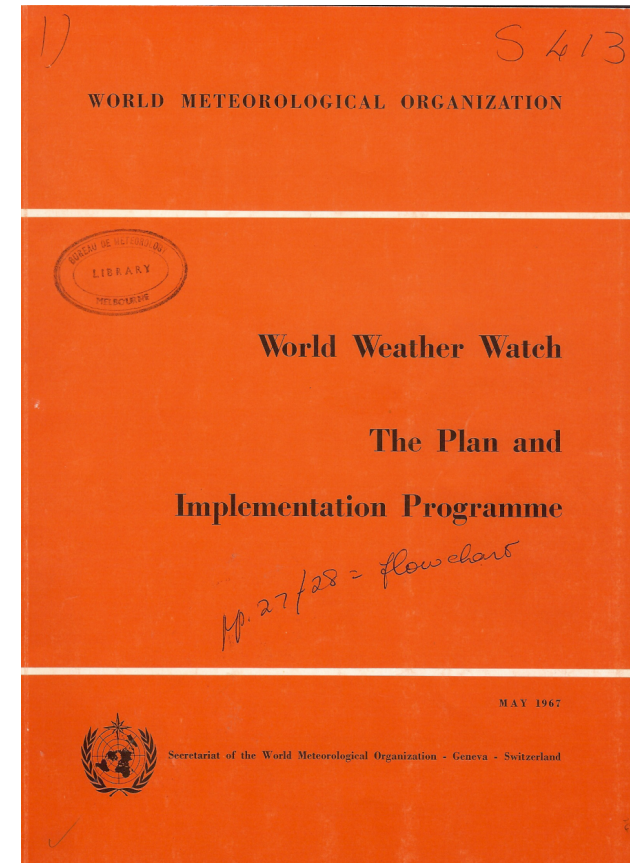
- National Services will combine their efforts in four main fields, namely **observations**, the collection and dissemination of information, the processing and analysis of information and scientific research
- This cooperation isvoluntary and is based on the principle that **each Service will provide all that it can to, and obtain all that it requires from, the common fund**
- This cooperation is possible only under peaceful conditions and... it should be planned and established exclusively on (that) basis.

ESTABLISHMENT OF WORLD WEATHER WATCH

Resolutions 16-17 (Congress-V) (1967)

The Congress

- Confirms its endorsement of the concept of an improved world meteorological system to which the name **World Weather Watch** has been given.
- Adopts the plan for the **World Weather Watch**....
- Urges all Members... to cooperate actively, enthusiastically and promptly in the implementation and operation of the **World Weather Watch**.....
- Urges all Members..... To contribute the maximum that their resources will permit towards its immediate implementation



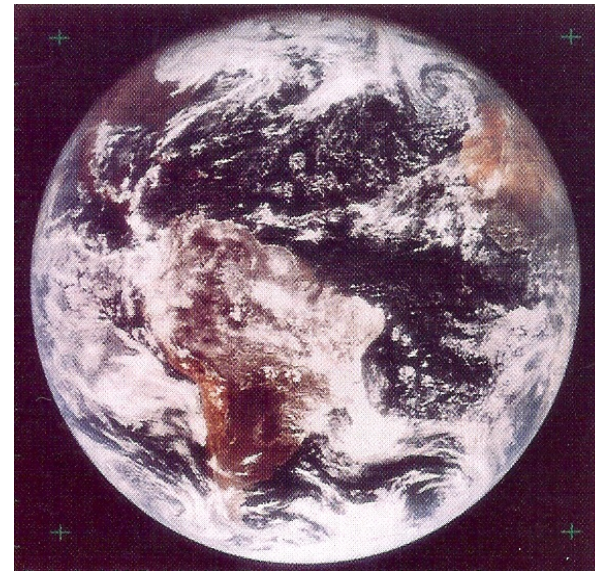
FIRST GEOSTATIONARY SATELLITES

ATS-I (Pacific)
(Launched December, 1966)



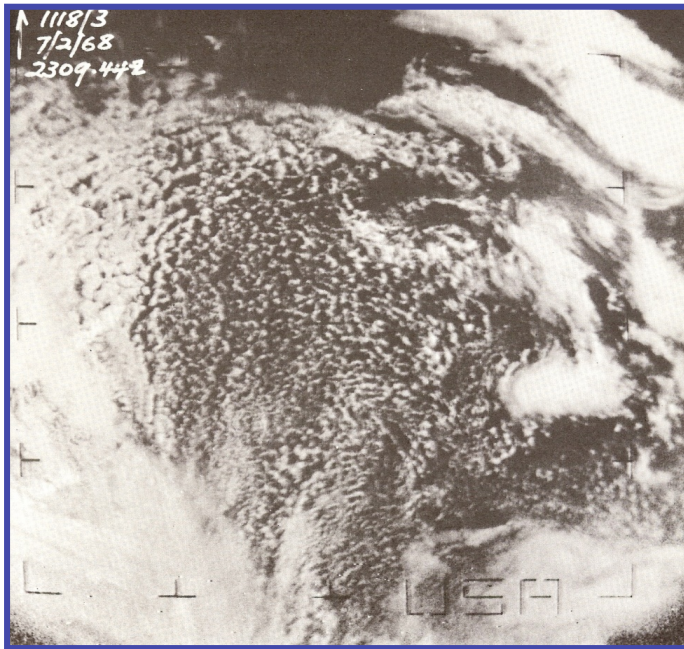
26 June 1967

ATS-III (Americas)
(Launched November, 1967)

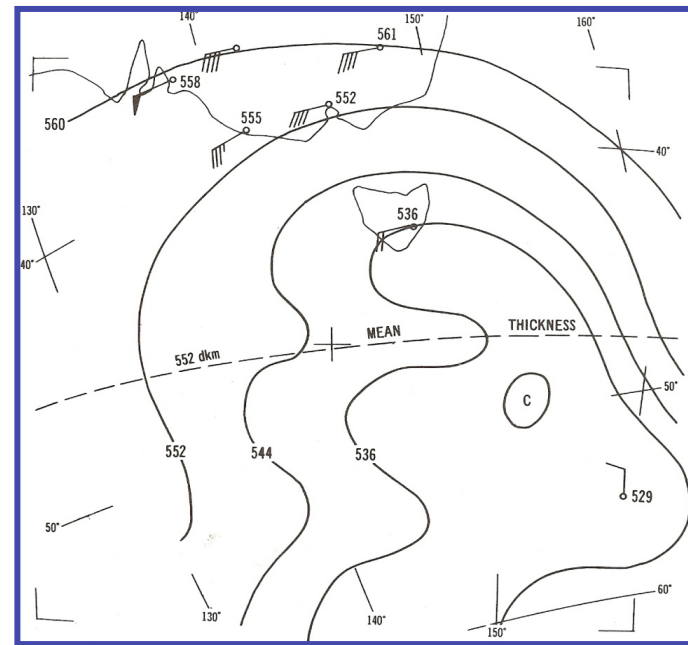


18 November 1967

WORLD METEOROLOGICAL CENTRE MELBOURNE: MARTIN/GUYMER IMAGE INTERPRETATION OVER THE SOUTHERN OCEAN (1968)



ESSA 6 Image (7 Feb 1968)

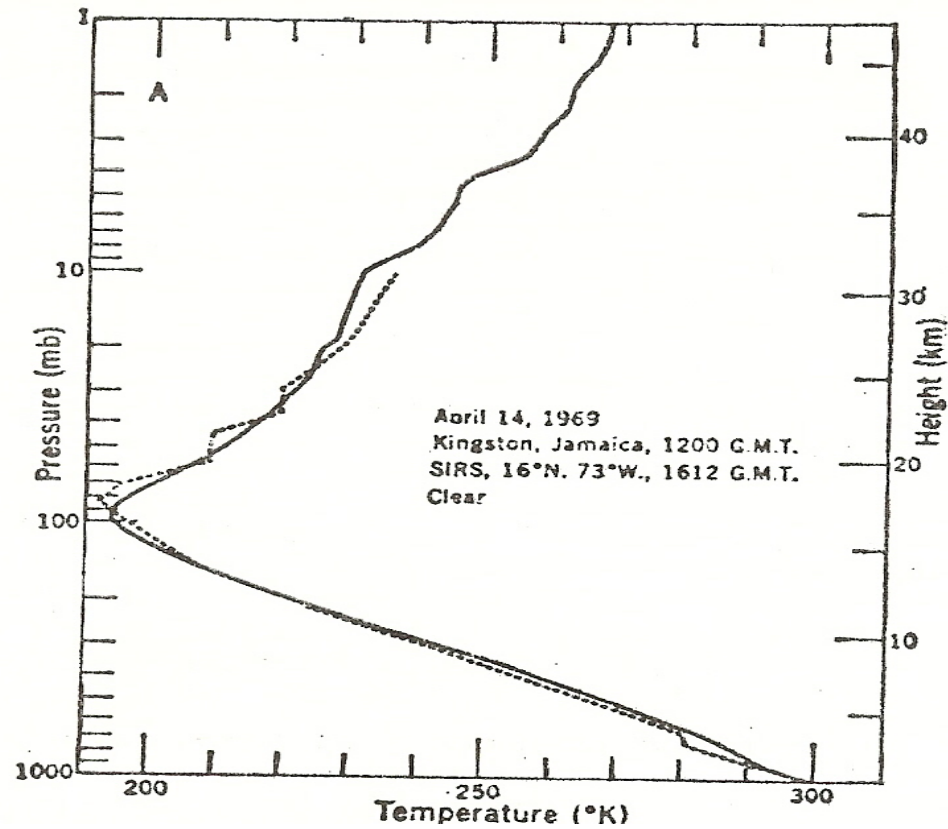


Inferred 1000-500 mb Thickness

**WMO INTER-REGIONAL (RA II-V)
SEMINAR ON THE INTERPRETATION OF
METEOROLOGICAL SATELLITE DATA
Melbourne, 25 Nov – 6 Dec 1968**



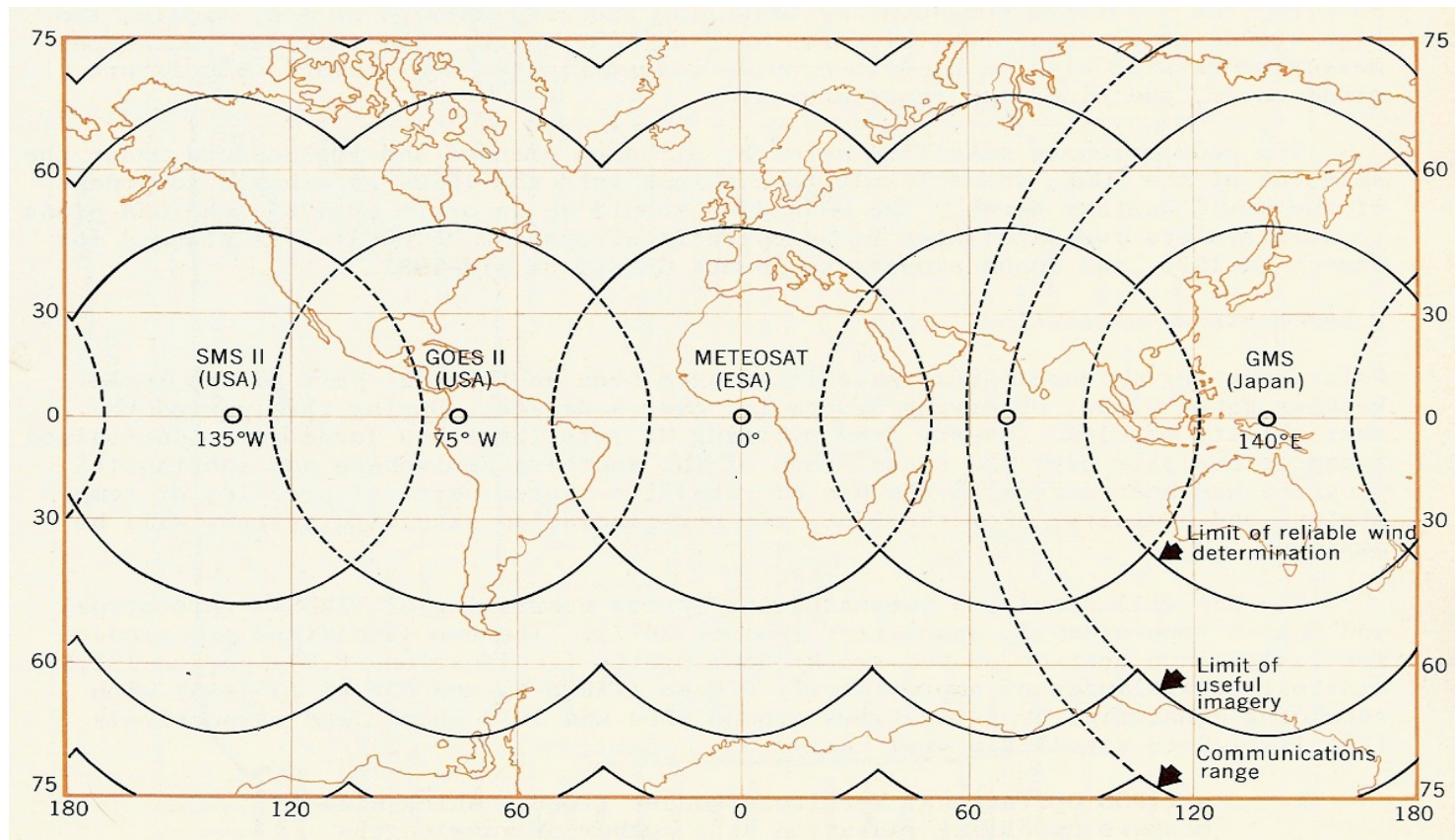
FIRST TEMPERATURE SOUNDINGS FROM SPACE (NIMBUS III SIRS April 14, 1969)



PLANNING FOR THE GLOBAL WEATHER EXPERIMENT (FGGE)



THE GEOSTATIONARY SATELLITE PLAN FOR FGGE

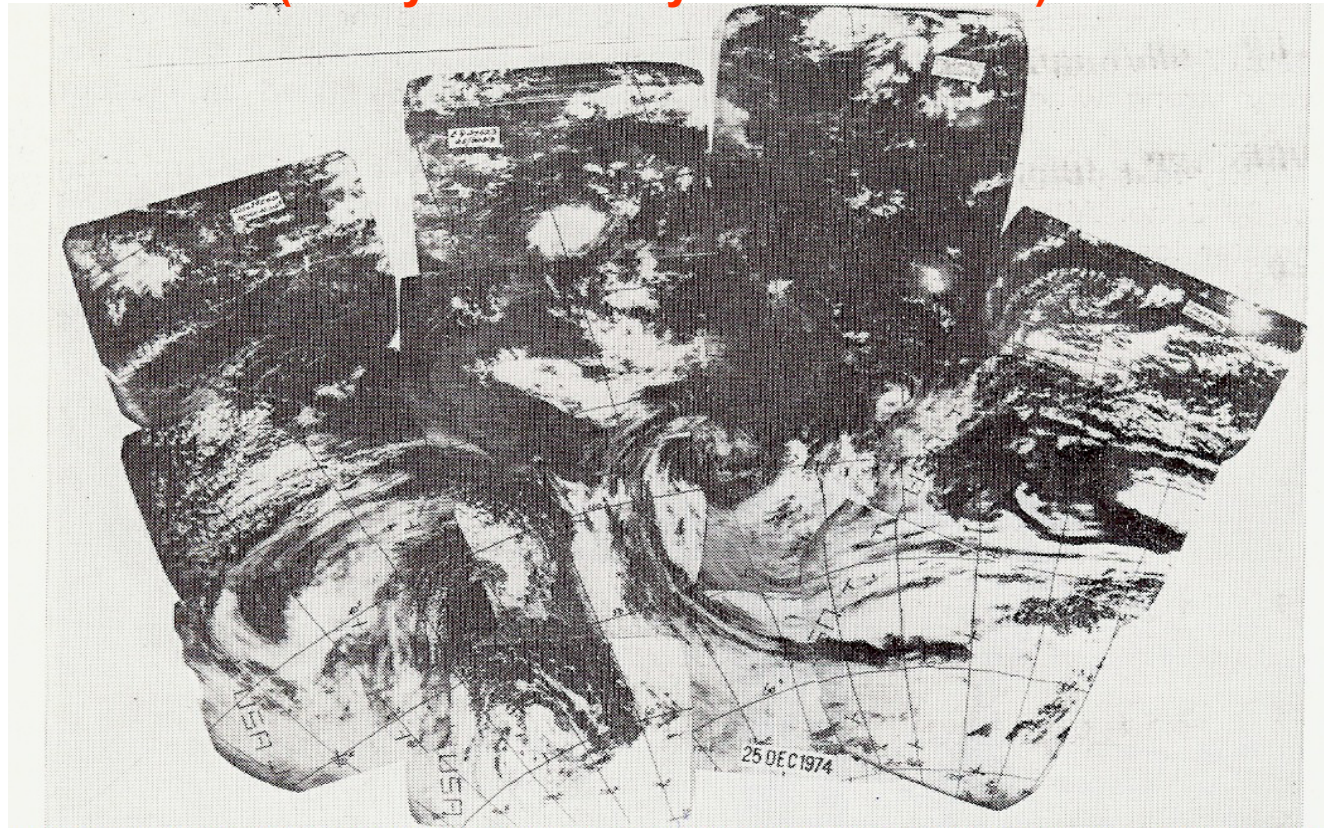


THE ED EPSTEIN (NOAA) INTERVENTION

(Industry/Government Conference on Tropical Cyclones, Perth, 1974)

- **For warning of tropical storms, the US regards the geostationary satellite as the first line of defence**
- **The (1979) GARP Global Weather Experiment will provide the information to design an optimal global observing system**
- **The US can't do it all. Europe and Russia will be providing satellites. Japan is planning a geostationary satellite**
- **Australia has much more to gain from GARP than the countries of the northern hemisphere**
- **If Australia contributes to the Japanese GMS, it will help ensure its success and contribution into the future.**

**OPERATIONAL CLOUD MOSAIC FOR
CHRISTMAS DAY 1974
(As Cyclone Tracy strikes Darwin)**



1977 COMMISSIONING OF AUSTRALIAN RECEPTION STATION FOR GMS -1

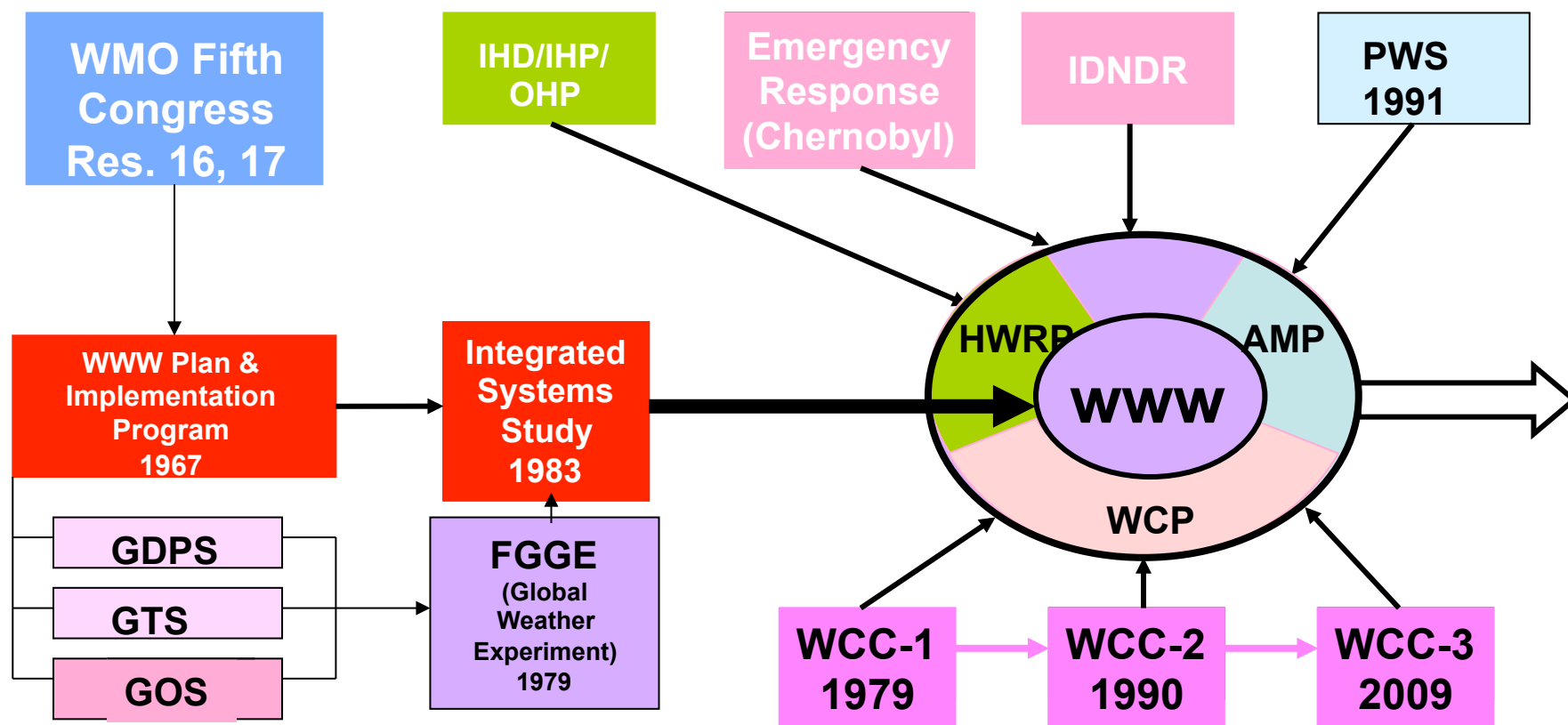
(Dr W J Gibbs and Senator J J Webster)



GMS-1 REVOLUTIONISES SYNOPTIC ANALYSIS FOR THE ASIA-PACIFIC (8 September 1977)



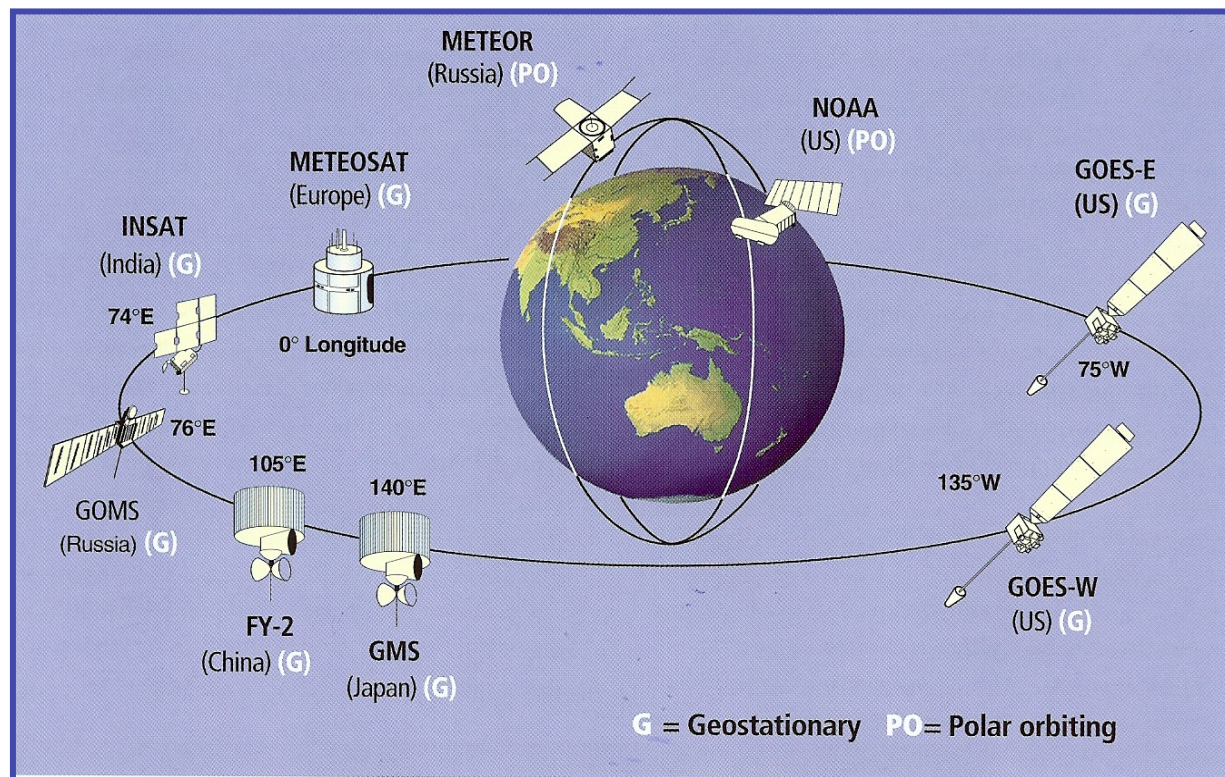
WORLD WEATHER WATCH EMERGES AS THE CORE PROGRAMME OF WMO IN THE 1980s



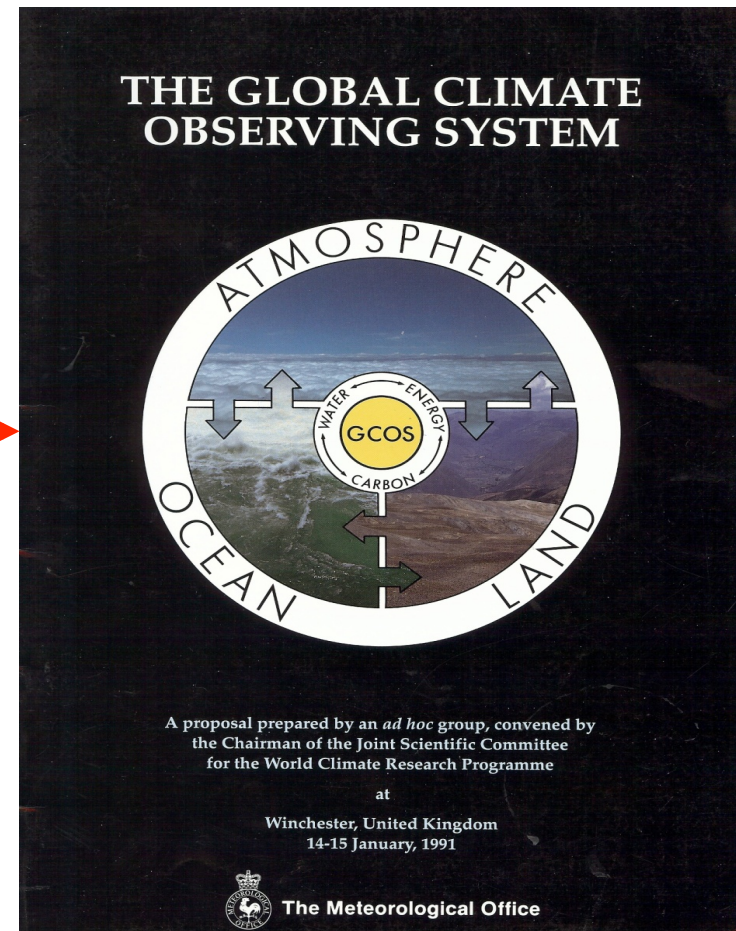
ZOU - SUOMI



METEOROLOGICAL SATELLITES AS THE FOUNDATION FOR THE WWW GLOBAL OBSERVING SYSTEM (GOS) IN THE 1990s



ORIGIN OF THE GLOBAL CLIMATE OBSERVING SYSTEM (GCOS) AT WCC-2 (1990)

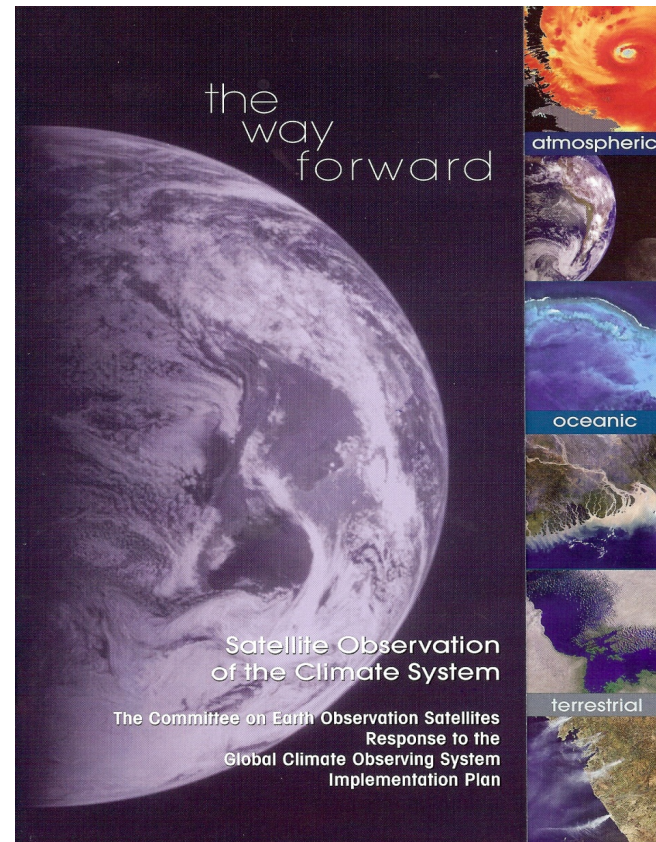
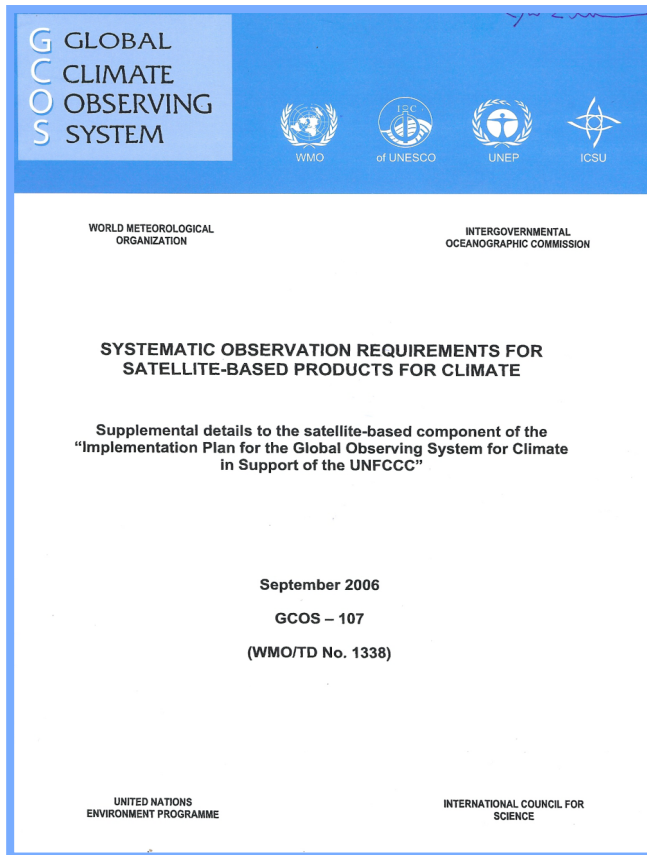


CHALLENGES FOR METEOROLOGY AT THE CROSS-ROADS OF CHANGE

(Malone, 1993)

“ The first is to expand the function of the Global Climate Observing System to include in real time the geophysical, social, economic, demographic and other variables that, taken together, specify “the state of the world” and provide a data base for the study of global change in its largest meaning.”

THE SATELLITE SUPPLEMENT TO THE GCOS IMPLEMENTATION PLAN AND THE CEOS RESPONSE



AGENTS FOR IMPLEMENTATION OF THE SPACE-BASED COMPONENTS OF GCOS

International Coordination Mechanisms

- CEOS (Committee on Earth Observation Satellites)
- CGMS (Coordination Group for Meteorological Satellites)
- HLCC (WMO High Level Consultative Committee on Satellites)
- SCOPE-CM (Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring)
- GEO (Group on Earth Observations)

Regional/Specialized Intergovernmental Organizations

- ESA (European Space Agency)
- EUMETSAT (European Organization for the Exploitation of Meteorological Satellites)

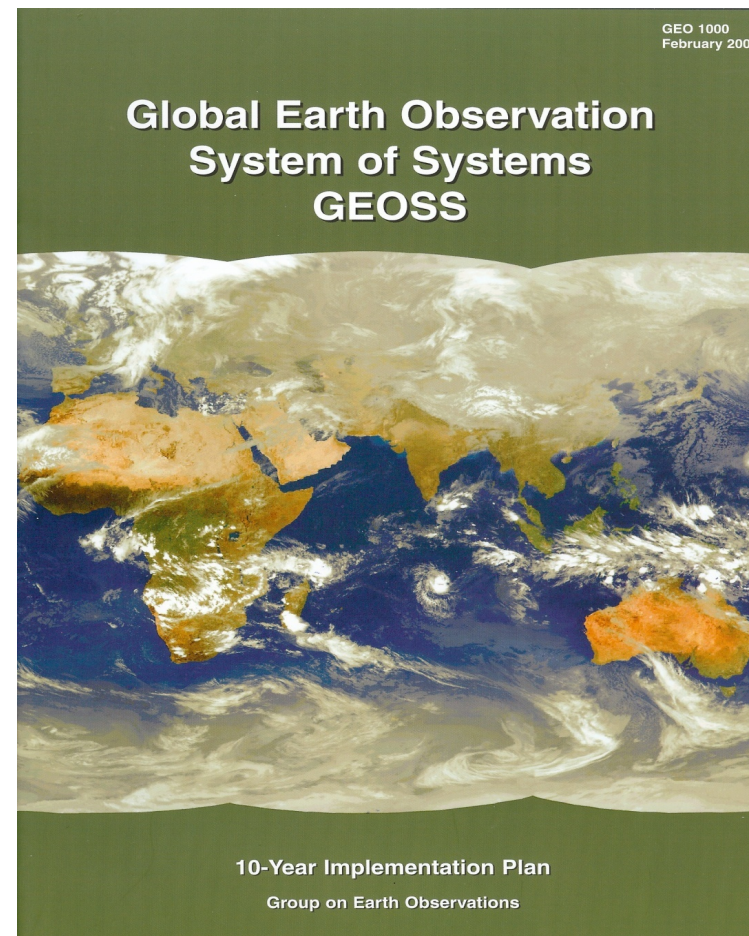
National Space Agencies

- | | | |
|--|-------------------|---------------|
| – NASA, NOAA/NESDIS (US) | CNES (France) | DLR (Germany) |
| – FSA, Roshydromet (Russia) | CNSA, CMA (China) | INPE (Brazil) |
| – JAXA, JMA (Japan); KMA ISRO, IMD (India) | CSA (Canada) | |

PARTICIPANTS AT THE 2003 EARTH OBSERVATION SUMMIT



GEOSS 10-YEAR IMPLEMENTATION PLAN 2005



THANK YOU

WELCOME TO METEOROLOGY

TRANSFORMED