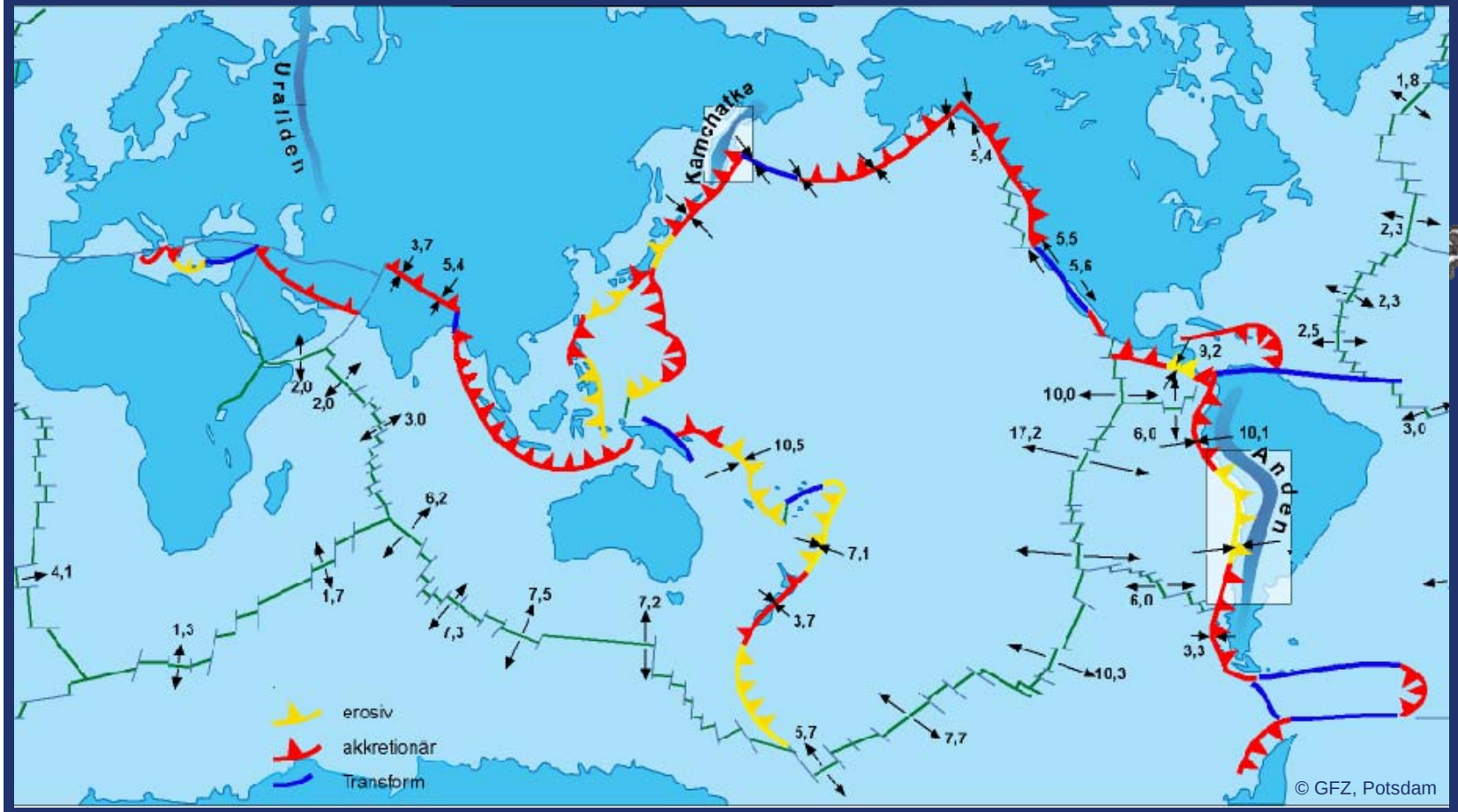
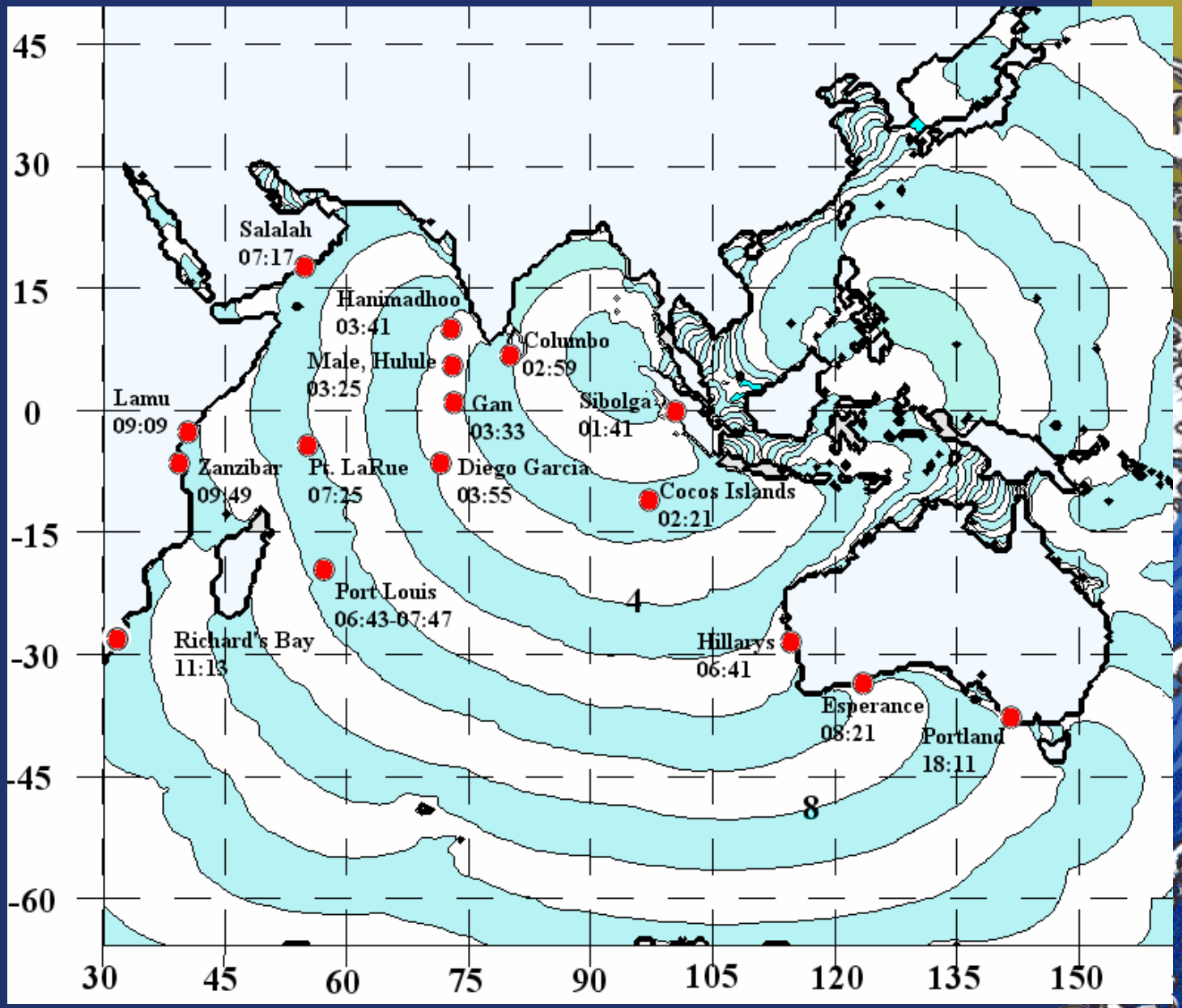
Building the Indian Ocean Tsunami Warning and Mitigation System : Lessons Learnt

ITU/OASIS Workshop on Public Warning
19-20 October 2006, Geneva, Switzerland

Dr. Peter Koltermann, Head Tsunami Unit IOC, UNESCO

The threat and major source for tsunamis




45
30
15
0
-15
-30
-45
-60
30
45
60
75
90
105
120
135
150
Salalah
07:17
Hanimadhoo
03:41
Male, Hulule
03:25
Columbo
02:59
Lamu
09:09
Gan
03:33
Sibolga
01:41
Zanzibar
09:49
Pt. LaRue
07:25
Diego Garcia
03:55
Cocos Islands
02:21
Port Louis
06:43-07:47
4
Richard's Bay
11:13
Hillarys
06:41
Esperance
08:21
Portland
18:11
8

IOC co-ordinates Tsunami Warning Systems globally as an end-to-end system

IOC's mandate is to be there **before** marine disasters strike

Tsunami Early Warning System

- O upstream
  detection, verification, prediction of tsunami wave, dissemination of tsunami information, international, intergovern-mental
- O downstream
  issue national warnings, initiate national warning command chain, prepare and implement standardized reaction

- ***1965: IOC established the ICG/ITSU International Coordination Group for the Tsunami Warning System in the Pacific (TWSP) -> successful & operational Tsunami Warning & Mitigation system***

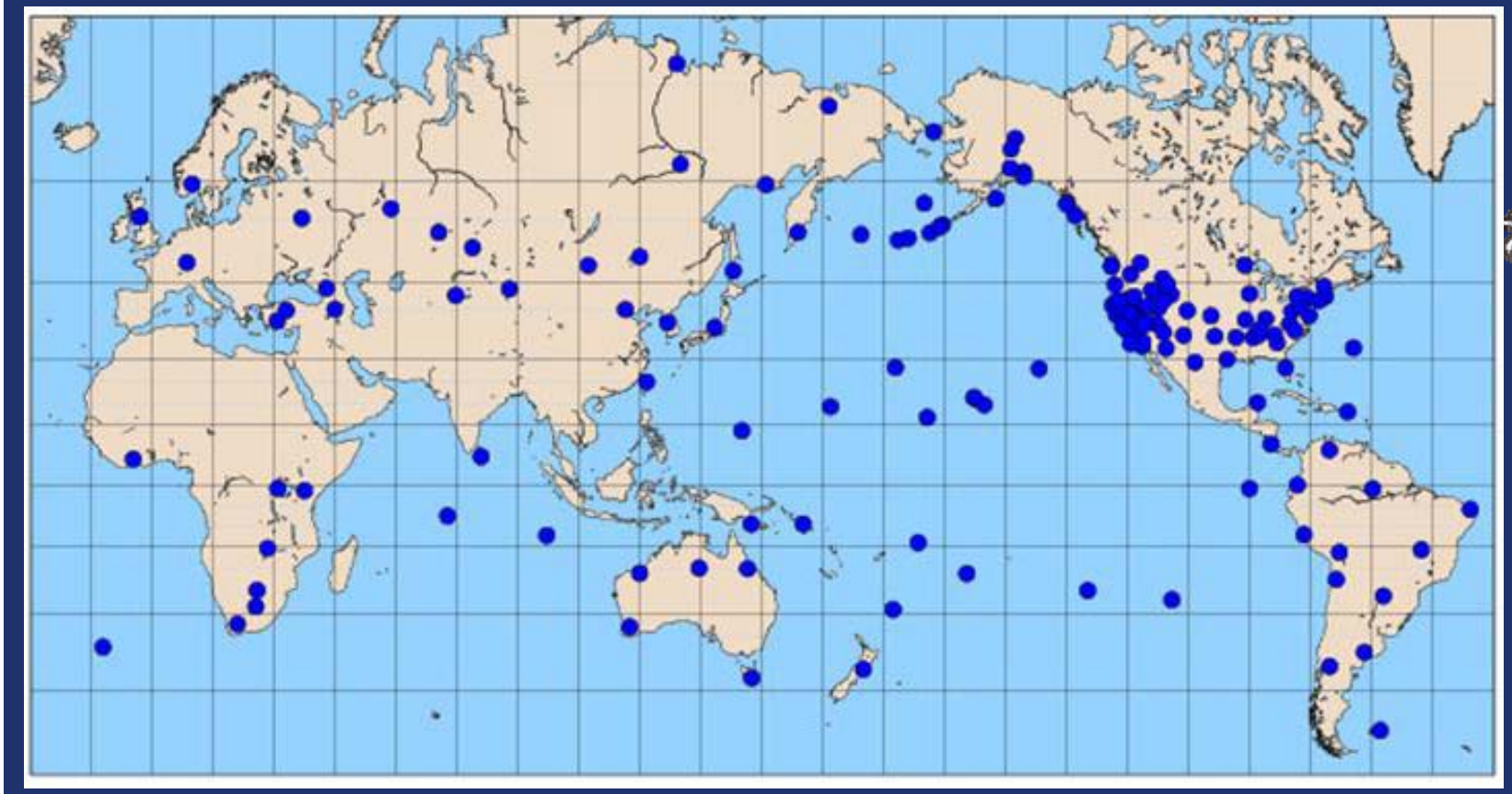
IOC ICG/PTWS

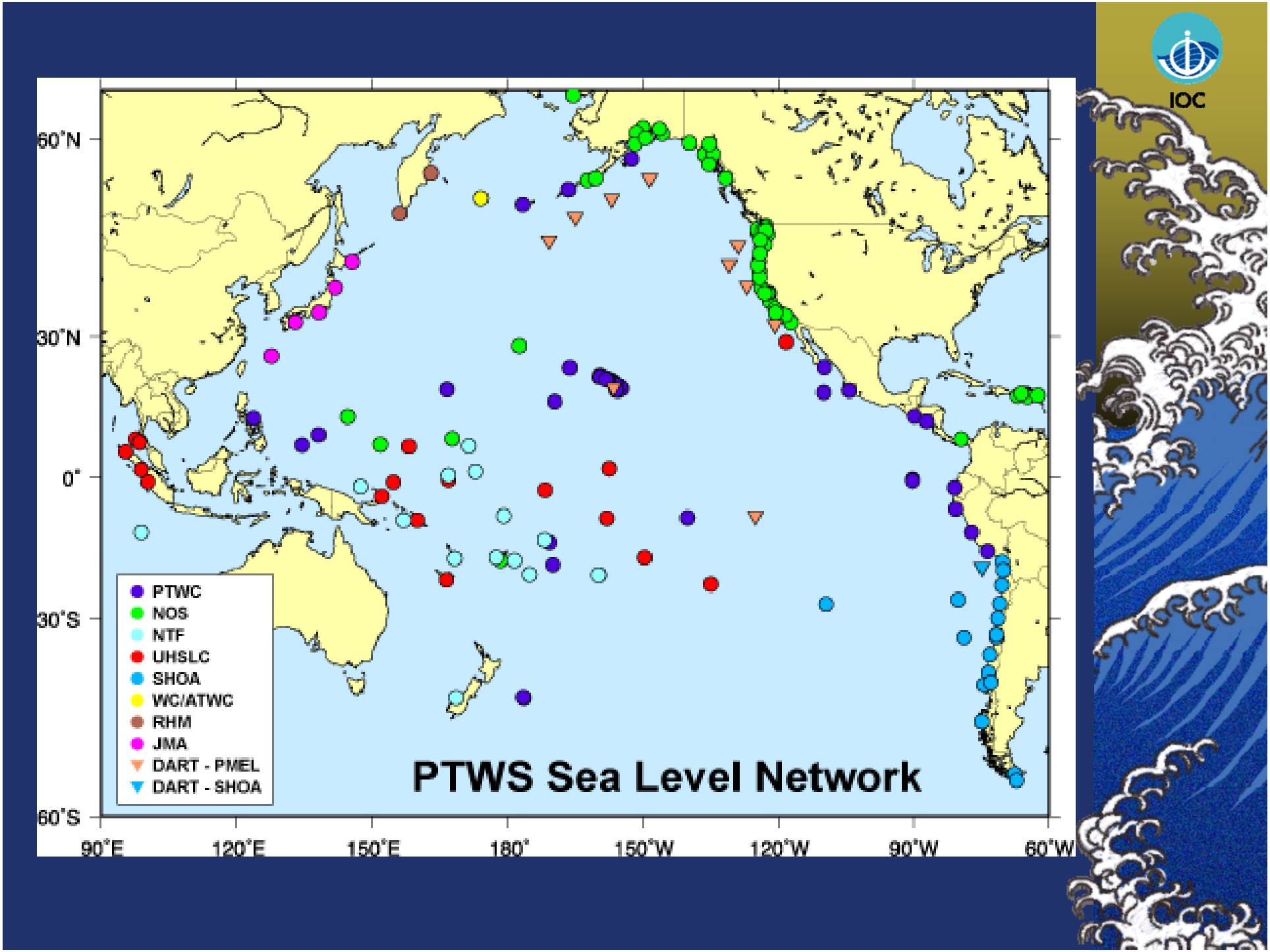
28 member States (2005):

Australia, Canada, Chile, China, Colombia, Cook Islands, Costa Rica, Democratic, People's Republic of Korea, Ecuador, El Salvador, Fiji, France, Guatemala, Indonesia, Japan, Mexico, New Zealand, Nicaragua, Peru, Philippines, Republic of Korea, Russian Federation, Singapore, Thailand, United States, Samoa.

- ***Successful Operational Tsunami Warning System > 40 yrs***
- ***Successful international scientific program***
- ***Pacific Basin monitoring of seismicity and sea levels***
- ***Direct humanitarian aim***
- ***Mitigate tsunami effects - save lives/property***

PTWS seismic network

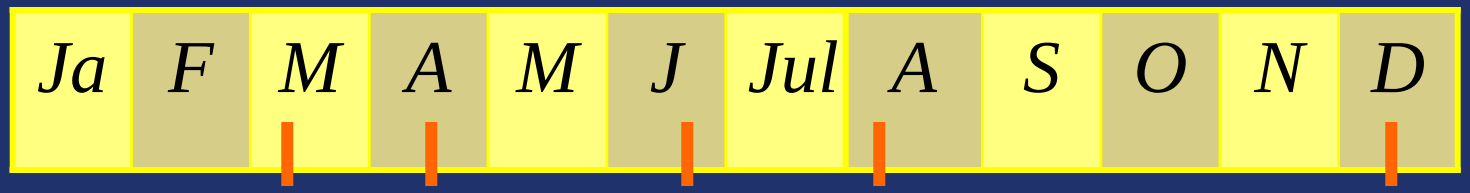



IOC
60°N
30°N
0°
30°S
60°S
90°E
120°E
150°E
180°
150°W
120°W
90°W
60°W
PTWC
NOS
NTF
UHSLC
SHOA
WC/ATWC
RHM
JMA
DART - PMEL
DART - SHOA
PTWS Sea Level Network

Establishment of an Indian Ocean Tsunami Warning System

- *March & April 2005: In the aftermath of greatest tsunami in recorded history on Dec 26th 2004, IOC held two International Coordination meetings on the development of an IOTWS in Paris and Mauritius*

Time schedule and milestones in 2005



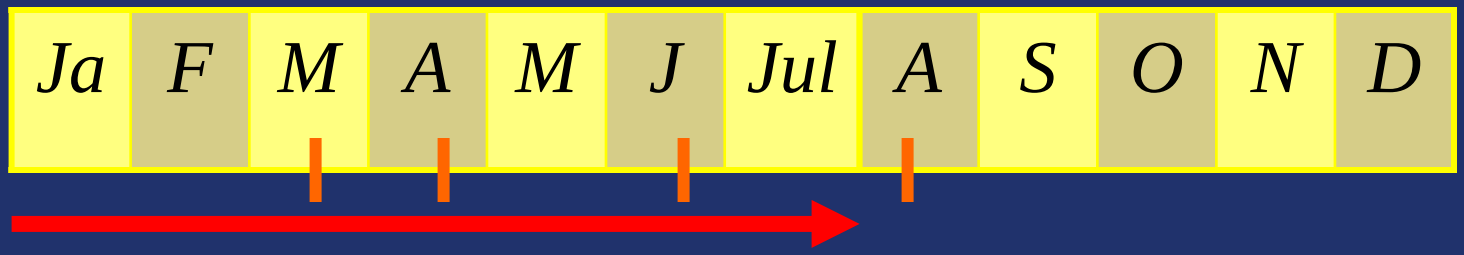
Implementation Interim System IOC-JMA-PTWC

18-20 National Assessment Missions
IOC/ISDR/WMO/ADRC/JMA/UNESCAP

Sea level stations being deployed

- March 3-8: UNESCO/IOC 1st Regional Technical Coordination Meeting, Paris
- April 14-16: UNESCO/IOC 2nd Regional Coordination Meeting, Mauritius
- June 21: IOC General Assembly, Paris: Formal establishment of ICG/IOTWS
- August 3-5: ICG/IOTWS-I , Perth: focus on technical aspects
- December 14-16: ICG/IOTWS-II, Hyderabad: recommendations & commitments

Time schedule and milestones for 2006



Initial IOTWS established

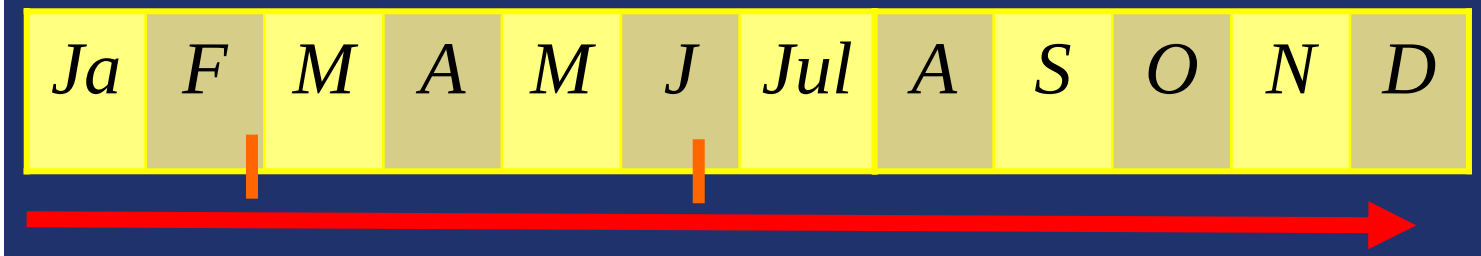
Core Regional System build up

IOTWS Implementation Plan

Focus on National Plans

- March 27: IOTWS Roundtable, in the margin of EWC-III, Bonn, Germany
- April 22-24: WMO meeting on Multi-hazard, Geneva, Switzerland
- June 21-29: IOC Executive Council: Report to Member States on ICG/IOTWS
- July 31-August 2: ICG/IOTWS-III, Bali: IOTWS Implementation Plan adopted

Time schedule and milestones for 2007



Continued focus on implementing national plans

- End of February : ICG/IOTWS-IV in Kenya
- June : IOC General Assembly: Report to IOC Member States on the progress of the establishment of an IOTWS

Since July 2006 an Initial IOTWSystem is in place

Based on Existing:

- 26(29) National 24x7 Information Centres slowly evolving into a
- Network of Tsunami Warning Centres in charge of National Plans

Need to improve Regional Instrumental Networks:

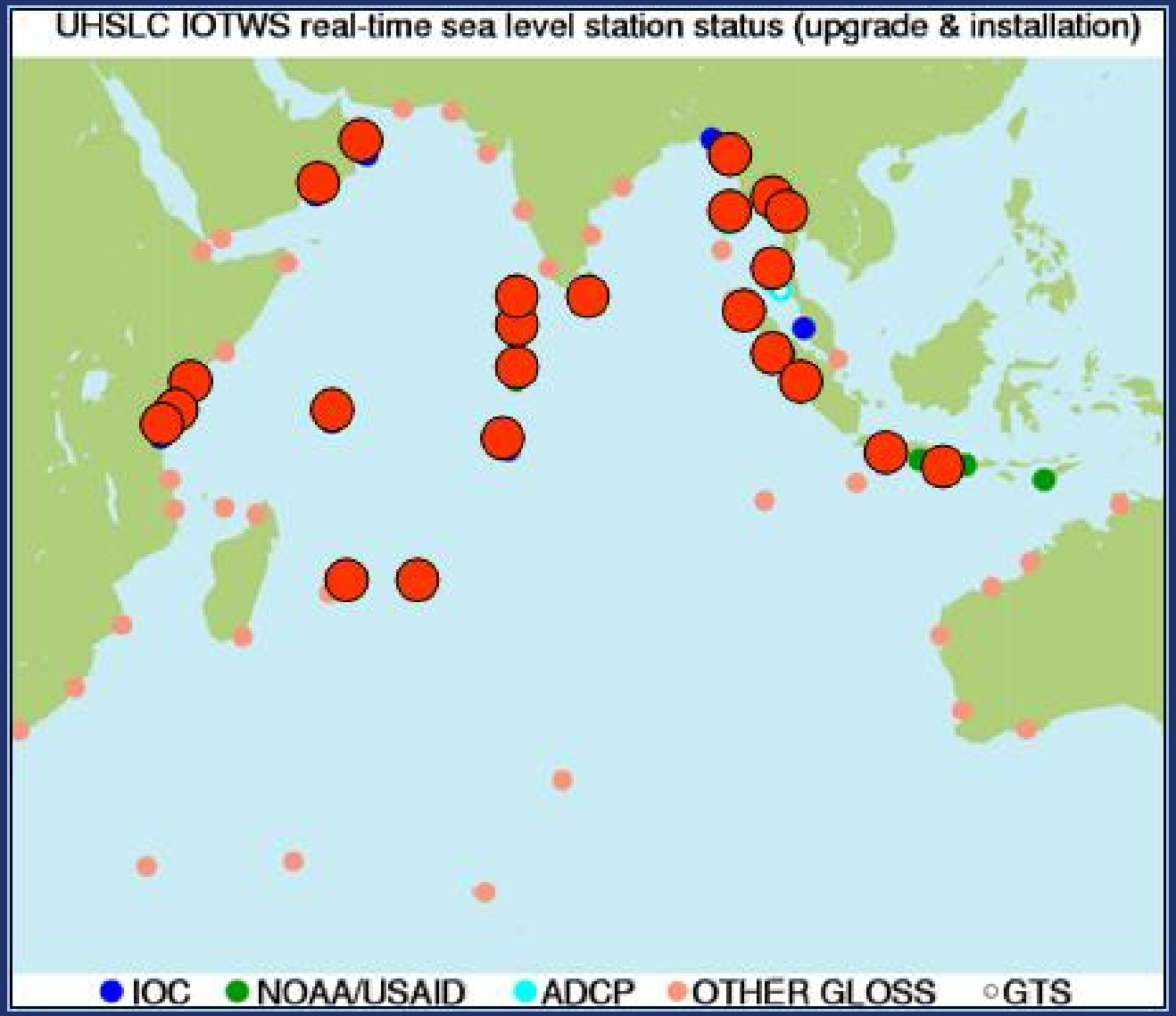
- Improved Seismographic network (faster and more accurate) detection of earthquakes
- Real-time (1-5min transmission interval) network of sea-level stations near tsunami source zones

System Constraints

- *Culturally very heterogeneous regions*
  - *Language, custom, attitude*
  - *Language dominance*
  - *Solutions imposed*
  - *Stakeholders involvement entitles to a*
    - *Bottom-up approach*

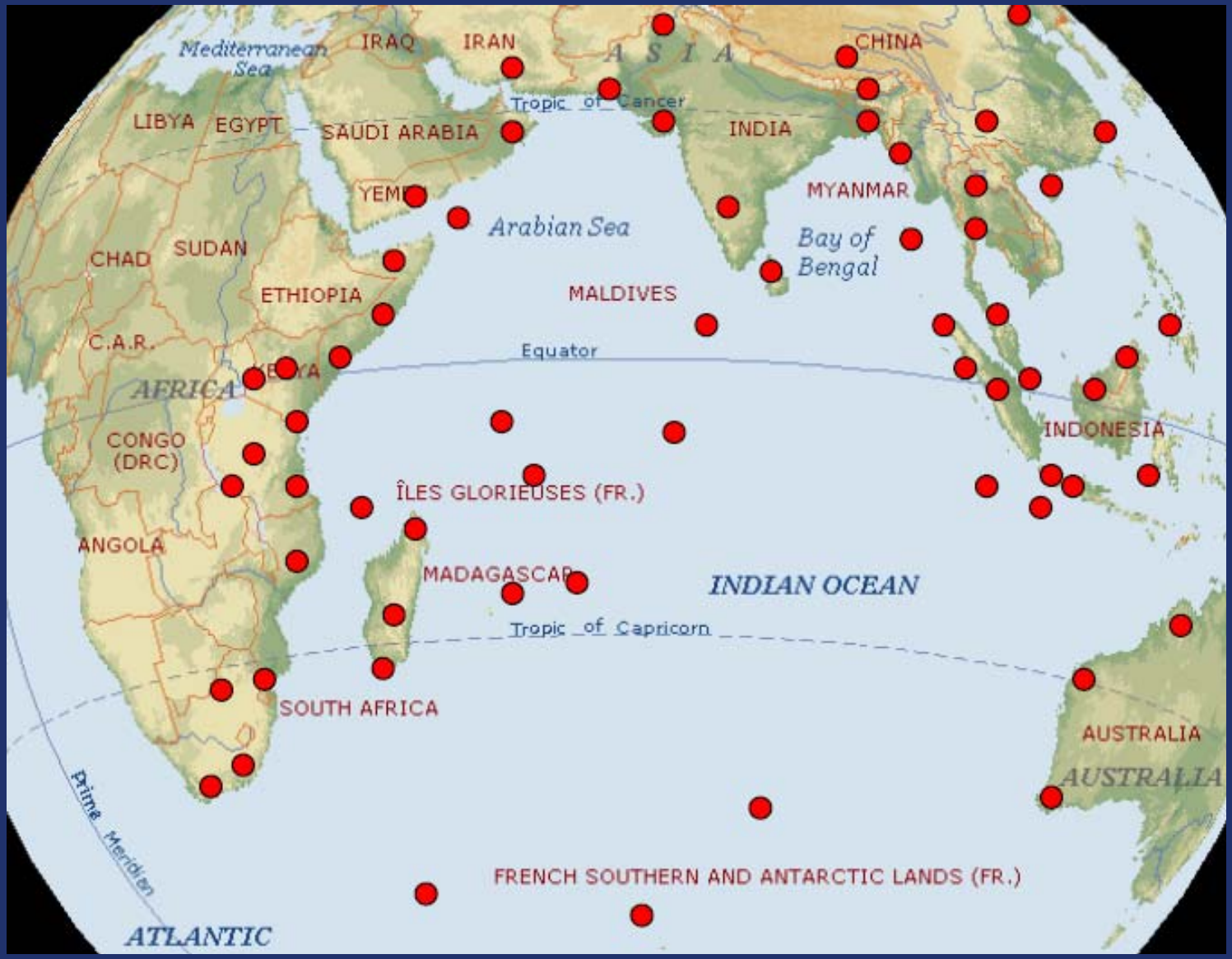
IOC

28 new real time sea level stations



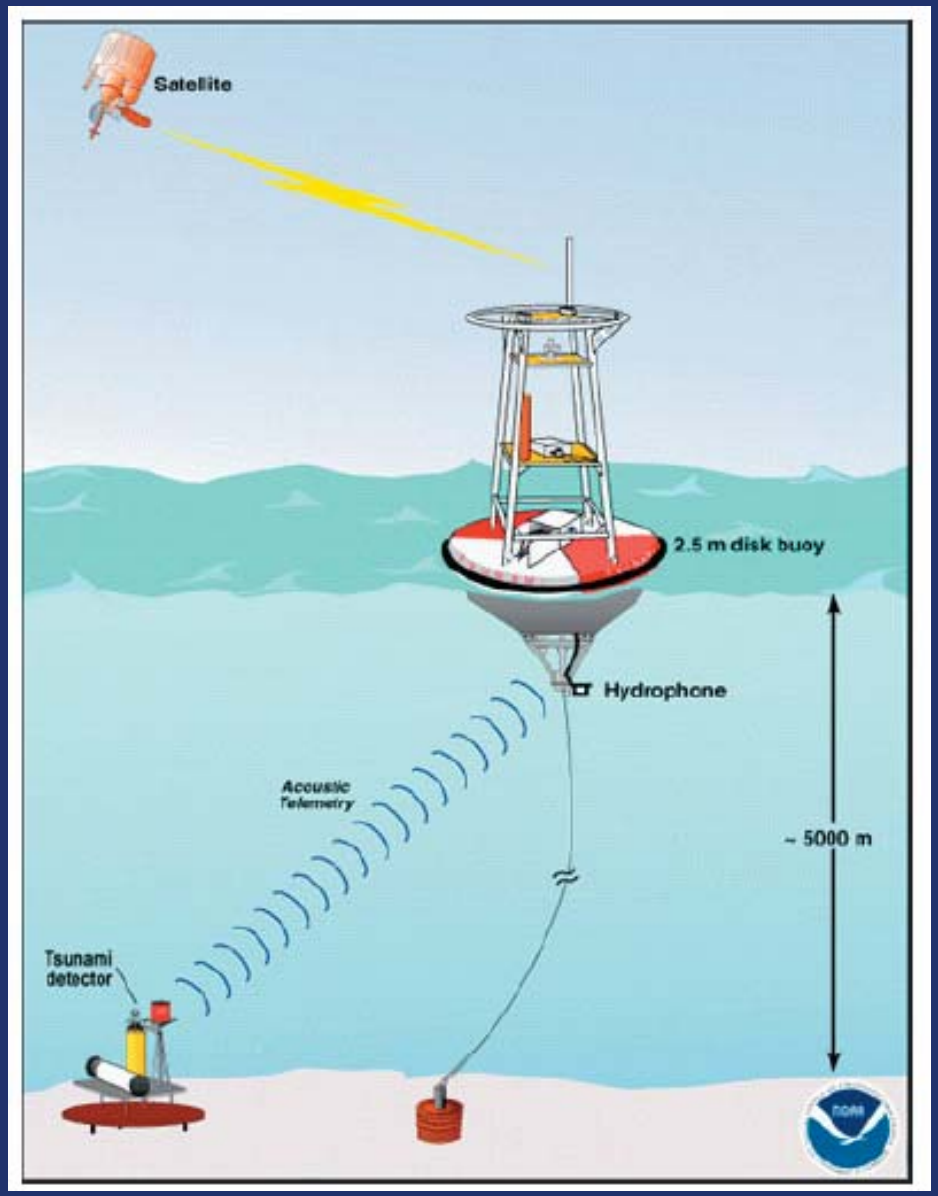
IOC

Agreed upgrade of the Seismographic network



IOC

IOC ICG/ITSU


Satellite
2.5 m disk buoy
Hydrophone
Acoustic Telemetry
~ 5000 m
Tsunami detector


GITEWS
TSUNAMI


3 DART-like systems
deployed

Assessment of Capacity Building Requirements for an Effective and Durable Tsunami Warning and Mitigation System in the Indian Ocean

Consolidated Report for Countries Affected by the 26 December 2004 Tsunami

IOC/INF-1219

UNESCO

IOTWS: National Assessment and Plans

	Nat.Asses	Nat. Plan		Nat.Asses	Nat. Plan
AUSTRALIA	Not required	**Available**	MYANMAR	Done	Required
BANGLADESH	Done	Required	OMAN	Done	Required
COMORES	Done	Required	PAKISTAN	Done	Required
DJIBOUTI	2006	Required	SEYCHELLES	Done	Required
FRANCE	Not required	**Available**	SINGAPORE	Not required	**Available**
INDIA	Not required	**Available**	SOMALIA	Done	Required
INDONESIA	Done	**Available**	S. AFRICA	2006	Required
IRAN	Done	Required	SRI LANKA	Done	Required
KENYA	Done	Required	TANZANIA	Done	Required
MADAGASCAR	Done	Required	THAILAND	Done	Required
MALAYSIA	Done	**Available**	TIMOR (EAST)	2006	Required
MALDIVES	2006	Required	**UAE**	Not requested	
MAURITIUS	Done	Required	UK	Not required	
MOZAMBIQUE	Done	Required	YEMEN	Done	Required

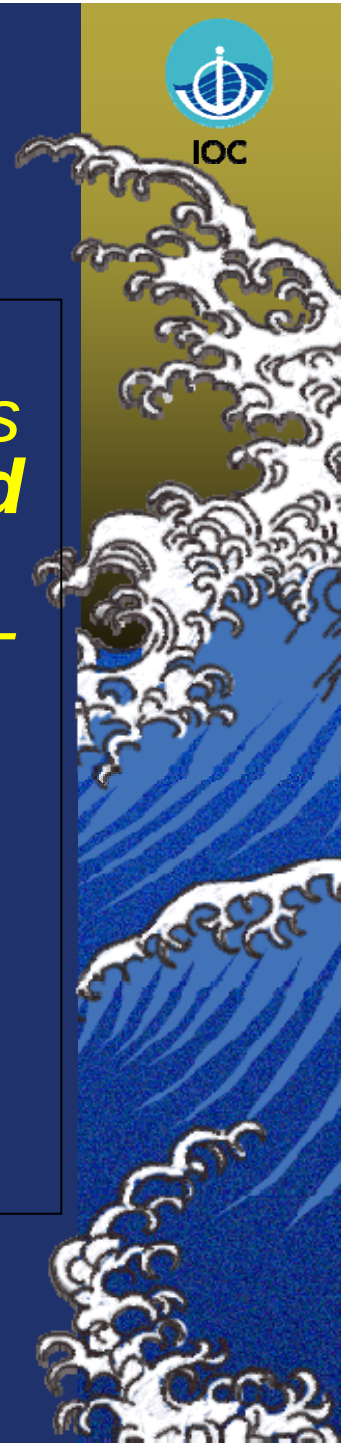
IOC

The Challenge

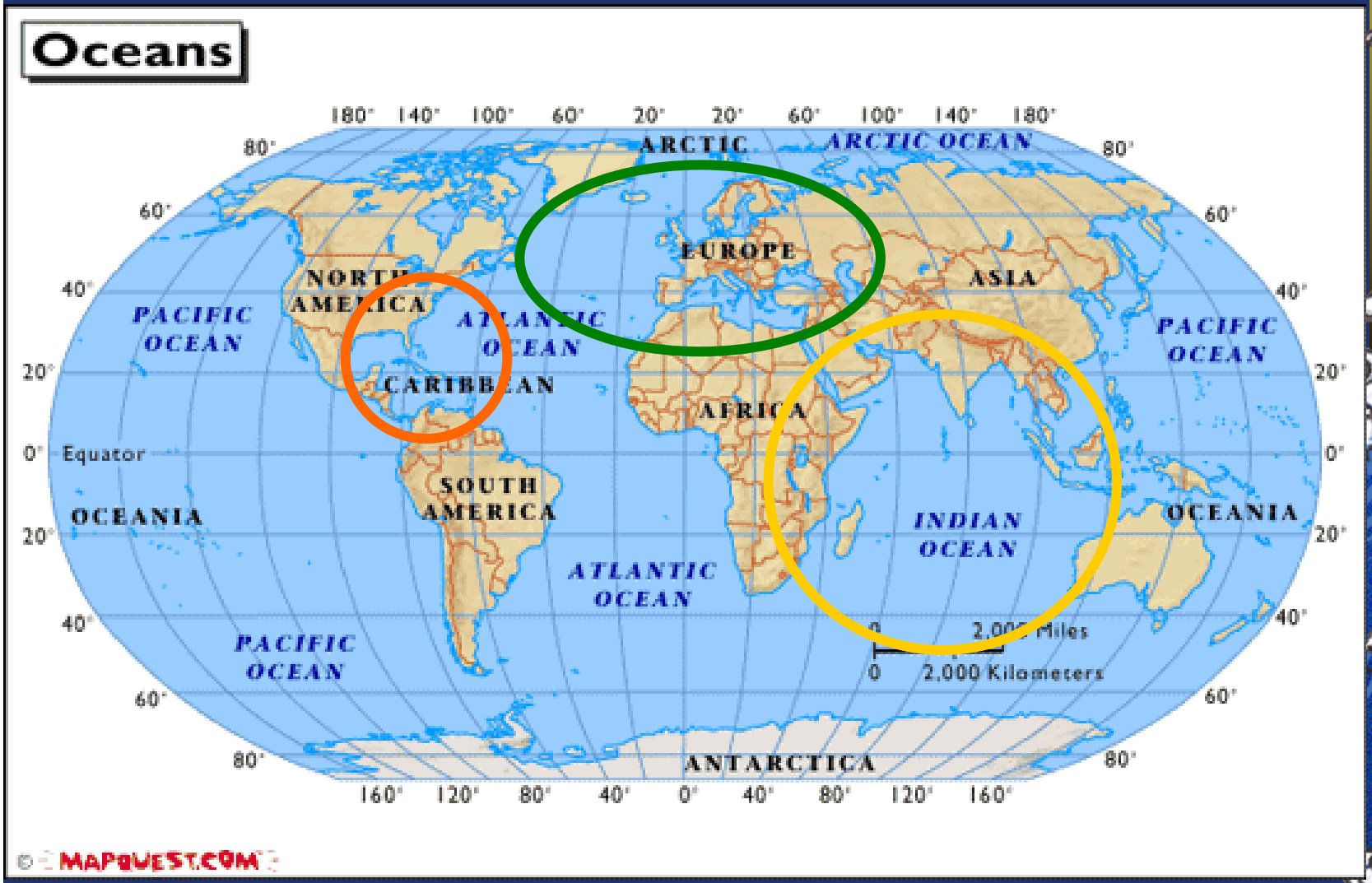
- *We essentially know what is needed at the country level in 18 countries while this work will be completed in 2006 for the rest*
- *The ICG requested a comprehensive action plan as a living document, harmonized with the country level*
- *There is a need to assist with the development of National Plans*

- *June 21-30, 2005: the 23rd IOC General Assembly decided resolutions on the establishment of **a global and three regional** Intergovernmental Coordination Groups on TEWS (XXIII-12 to XXXIII-15) for*

- the Indian Ocean (ICG/IOTWS)
- the Caribbean (ICG/CARTWS)
- the NE Atlantic and Med (ICG/NEAMTWS)



Three more regions to coordinate



Intergovernmental Coordination Group meetings

- *03-05 Aug 2005: ICG/IOTWS-I, Perth*
- *21-22 Nov 2005: ICG/NEAMTWS-I, Rome*
- *14-16 Dec 2005: ICG/IOTWS-II, Hyderabad*
- *10-12 Jan 2006: ICG/CARTWS-I, Barbados*
- *May 2006: ICG/ITSU-XXI, Melbourne*
- *May 2006: ICG/NEAMTWS-II, Nice*
- *August 2006: ICG/IOTWS-III, Bali*

and to come:

- *Jan 2007: ICG/CARTWS-II, Venezuela*
- *Feb 2007: ICG/NEAMTWS-III, Bonn*
- *Feb 2007: ICG/IOTWS-IV, Kenya*

System Tests

Tonga Earthquake 3 May 2006:

- **Tsunami advisory, media turned it into warning**

Merapi Vulcano 2006:

- **SMS clogged satellites after 92 secs**

Java Tsunami 17 July 2006:

- **Downstream path delayed**

Tsunami Early Warning System Characteristics

- *O* ***upstream***
- *hi-tech instrumentation, high speed +*
- *high quantity data links*
- *targeted dissemination*
- *few trained people, existing standards*
- *O* ***downstream***
- *low/no tech, broad dissemination*
- *→ recipients are untrained common people*
- *"the guy at the beach"*

Needs

UPSTREAM

- TRAINING, TRAINING
- Robust, standardized data streams
- redundence of sensors + power
- power independent
- accepted data policy

Needs

DOWNSTREAM

- TRAINING, TRAINING
- simple robust, technology
- power independent
- standardized simple contents
- non oral communication
- standardized simple glossary

Conclusions

- *O standardization of means and contents*
- *O keep it simple, get it cheaper*
- *O get sustained funding*
- *O don't overload the people involved*
- *O training at a levels, again and again*
- *O upstream:*
- *clear responsibilities, instant reaction*
- *- 90 s off warning interval cost extra 7 MUS$/y*
- *O downstream:*
- *low tech, simple message, trained response*

A perfect warning will be useless if people do not know what to do in case of an emergency

Awareness and preparedness at the country level is essential

Beyond immediate response: **Multi-Hazard Platforms**

- *Storm – surges (IOC, WMO, JCOMM)*
- *Tropical storms (WMO, JCOMM)*
- *Improving Storm and cyclones track forecasts (IOC, WMO, JCOMM)*
- *Ice Hazard (IOC, WMO, JCOMM)*
- *Oil Spills (IOC, WMO, UNEP)*

For further information see:

http://ioc3.unesco.org/ptws
http://ioc3.unesco.org/icg-iii
http://ioc3.unesco.org/neamtws
http://ioc3.unesco.org/cartws

- *Thank you*
- *for your interest and attention !*

- *And please keep this topic simple,*
- *it is and always be operational*