United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

3.4.1.2 Global Coordination of Warning and Mitigation Systems for Ocean Hazards

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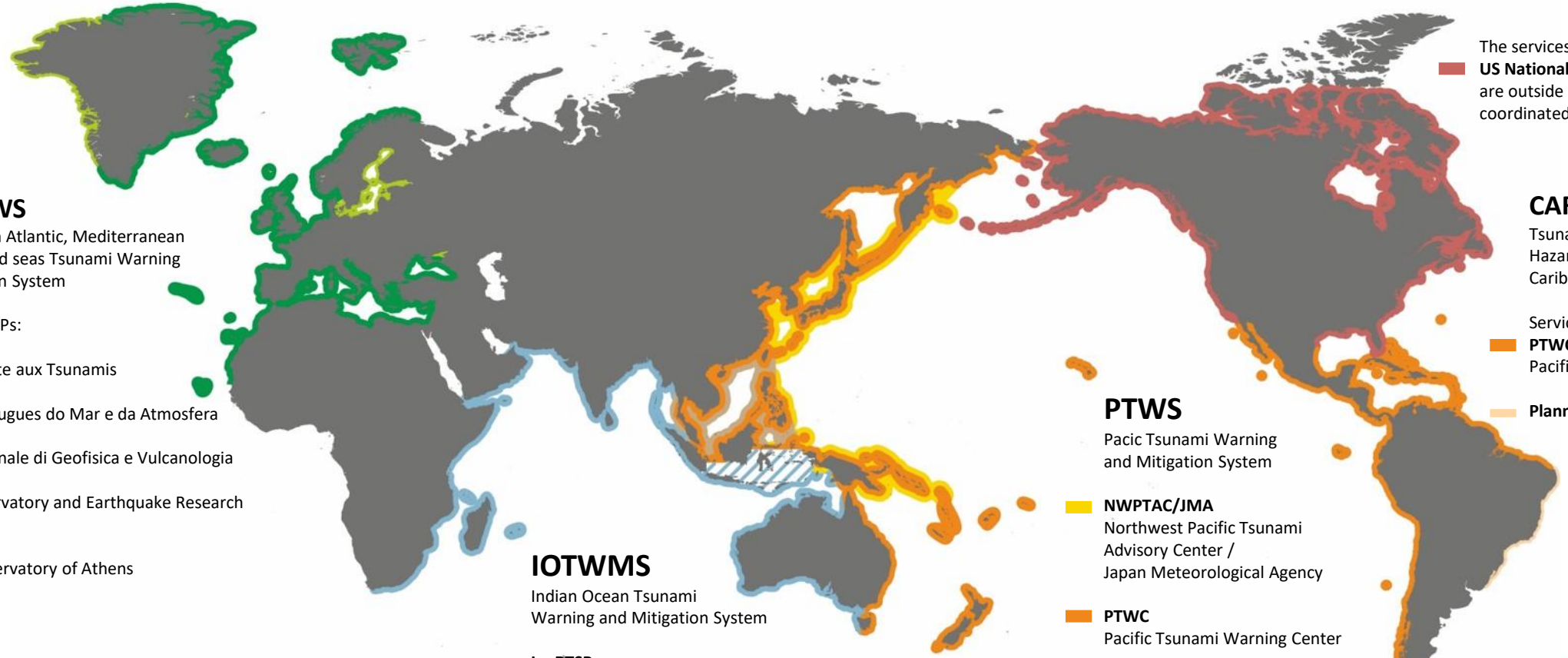
ACKNOWLEDGMENTS:
B. Aliaga
IOC Tsunami Unit

31st Session of the IOC Assembly
18 June , 2021

EXISTING SERVICES OF THE GLOBAL TSUNAMI WARNING SYSTEM

Intergovernmental Oceanographic Commission of UNESCO
2021 www.ioc-tsunami.org



NEAMTWS

North Eastern Atlantic, Mediterranean and connected seas Tsunami Warning and Mitigation System

Accredited TSPs:

- **CENALT**
  Centre d'Alerte aux Tsunamis
- **IPMA**
  Instituto Portugues do Mar e da Atmosfera
- **INGV**
  Istituto Nazionale di Geofisica e Vulcanologia
- **KOERI**
  Kandilli Observatory and Earthquake Research Institute
- **NOA**
  National Observatory of Athens

Planned

IOTWMS

Indian Ocean Tsunami Warning and Mitigation System

- **InaRTSP**
  Indonesian Regional Tsunami Service Provider
- **ITEWC**
  Indian Tsunami Early Warning Centre
- **JATWC**
  Joint Australian Tsunami Warning Centre

Service is provided by the **InaTEWS**
Indonesian Tsunami Early Warning System at the BMKG, outside the framework of the IOC-coordinated tsunami warning systems

PTWS

Pacic Tsunami Warning and Mitigation System

- **NWPTAC/JMA**
  Northwest Pacific Tsunami Advisory Center / Japan Meteorological Agency
- **PTWC**
  Pacific Tsunami Warning Center
- **SCSTAC/NMEFC**
  South China Sea Tsunami Advisory Center / National Marine Environmental Forecasting Center of P. R. China

The services provided by the **US National Tsunami Warning Center** are outside the framework of the IOC coordinated tsunami warning systems

CARIBE-EWS

Tsunamis and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions

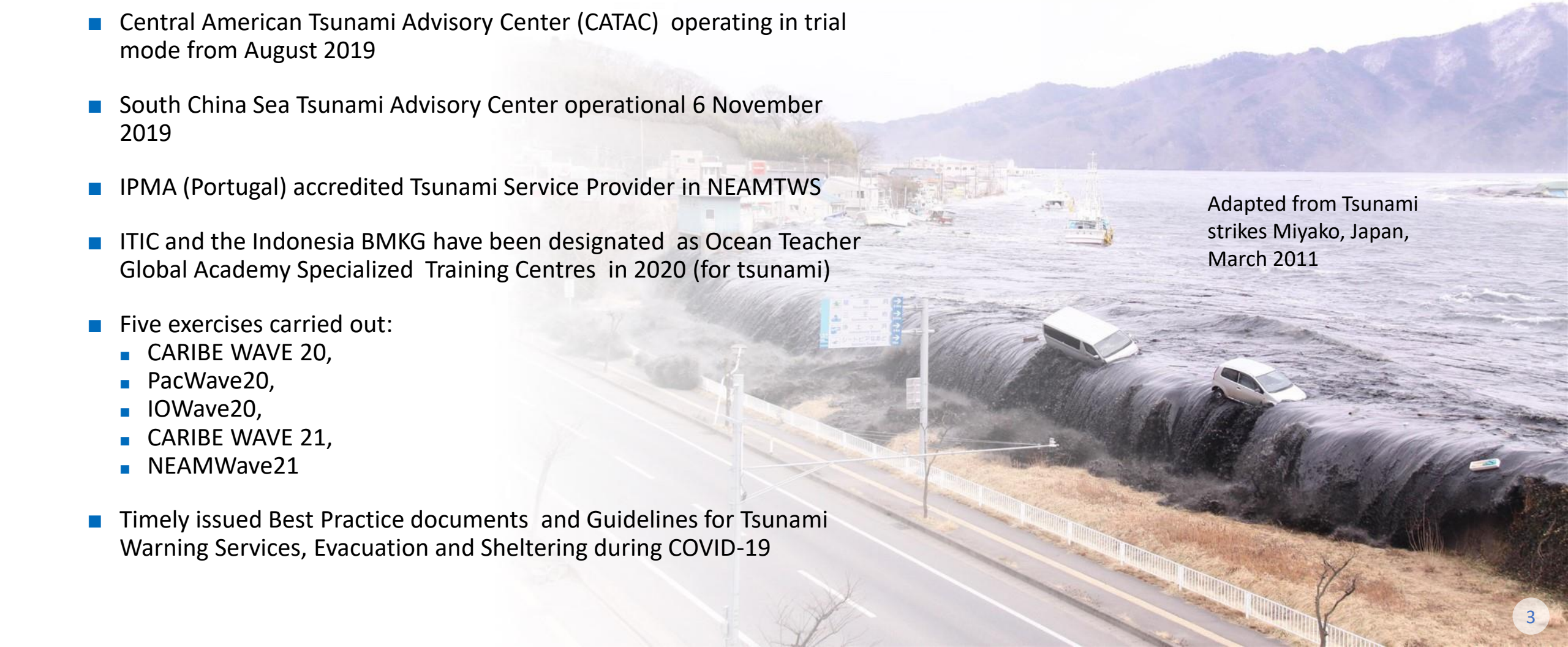
Service provided by
PTWC
Pacific Tsunami Warning Center

Planned

IOC TSUNAMI WATCH OPERATIONS

MAJOR ACTIVITIES IN 2019-2021

- 2 TOWS-WG and 4 its TTs meetings
- Central American Tsunami Advisory Center (CATAC) operating in trial mode from August 2019
- South China Sea Tsunami Advisory Center operational 6 November 2019
- IPMA (Portugal) accredited Tsunami Service Provider in NEAMTWS
- ITIC and the Indonesia BMKG have been designated as Ocean Teacher Global Academy Specialized Training Centres in 2020 (for tsunami)
- Five exercises carried out:
  - CARIBE WAVE 20,
  - PacWave20,
  - IOWave20,
  - CARIBE WAVE 21,
  - NEAMWave21
- Timely issued Best Practice documents and Guidelines for Tsunami Warning Services, Evacuation and Sheltering during COVID-19



Adapted from Tsunami strikes Miyako, Japan, March 2011

IOC TSUNAMI READY PROGRAMME

IOC TSUNAMI READY GUIDELINES

MITIGATION

- Have designated & mapped tsunami hazard zones
- Have a public display of tsunami information

PREPAREDNESS

- Produce easily understood tsunami evacuation maps as determined to be appropriate by local authorities in collaboration with communities
- Develop and distribute outreach and public education materials
- Hold at least three outreach or educational activities annually
- Conduct an annual tsunami community exercise

RESPONSE

- Address tsunami hazards in the community's emergency operations plan (EOP)
- Commit to supporting the emergency operations center (EOC) during a tsunami incident if an EOC is opened and activated
- Have redundant and reliable means for a 24-hour warning point (and EOC if activated) to receive official tsunami threats
- Have redundant and reliable means for 24-hour warning point and/or EOC to disseminate official tsunami alerts to the public

STRATEGY

- Be Aware
- Be Prepared

MAJOR ACTIVITIES IN 2019-2021

- Tsunami Ready recognition:
  - 4 Caribbean Sea
  - 2 Pacific Ocean
  - 2 Indian Ocean
- Publication of the International Symposium Summary Statement on lessons learnt from the 2018 tsunamis in Palu and Sunda Strait
- Publication of the IOC Manuals and Guides 82 "Preparing for community tsunami evacuations: from inundation to evacuation maps, response plans and exercises"

OCEAN DECADE TSUNAMI PROGRAMME:

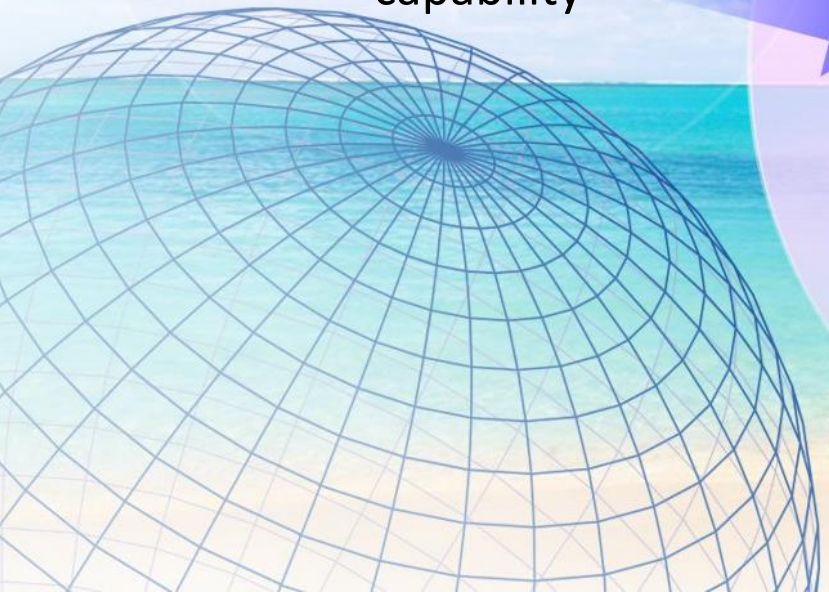
Seeking Major Advances in SCIENCE and PREPAREDNESS

New observational and analysis technologies to move from a **high-uncertainty** assumption-based capability to a **low-uncertainty** dynamic-based capability

RESILIENCE!

Communities respond to tsunami threats by combining accurate **real-time impact forecasts** with **deep community preparedness**. Tsunami disaster impacts are minimized, enabling rapid restoration of critical infrastructure and services

Comprehensive institutional & community preparedness and capacity building efforts aimed at achieving **IOC Tsunami Ready** designation across all socio-economic categories

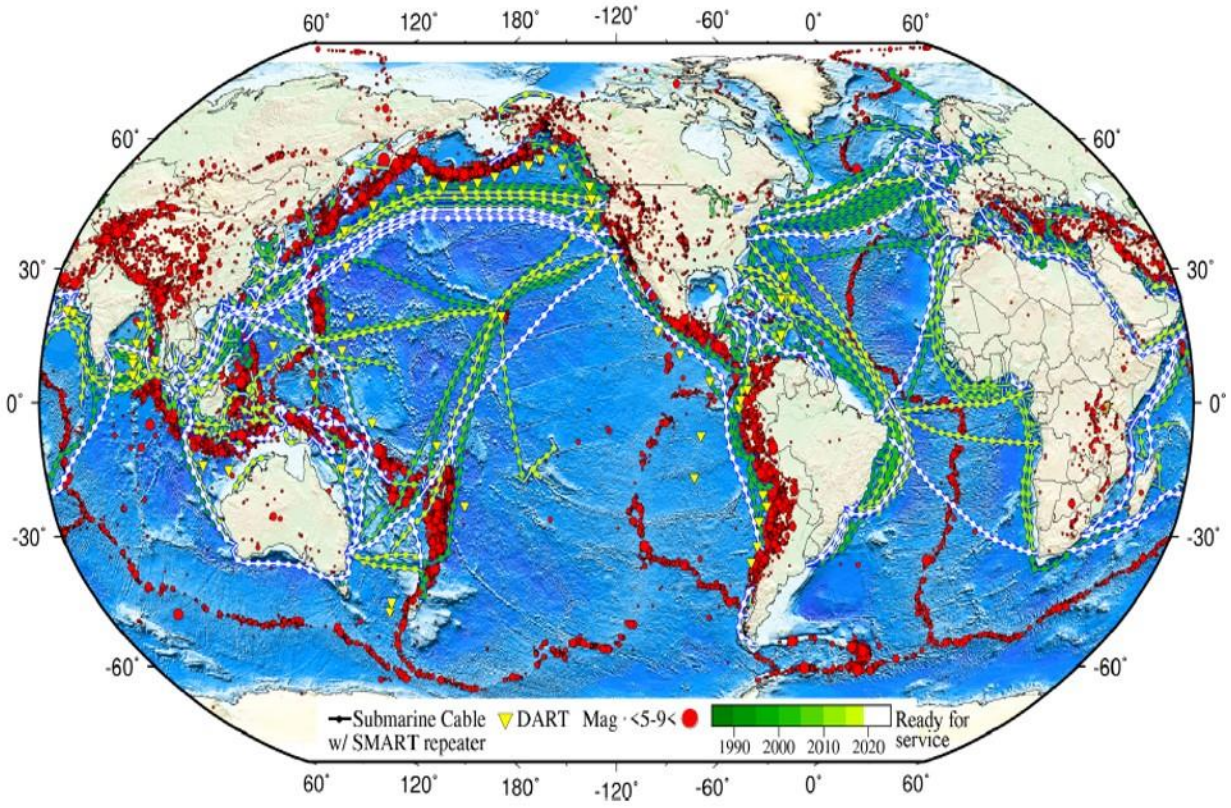


OCEAN DECADE TSUNAMI PROGRAMME:
the Focus Areas Related to Tsunami Warning Capabilities

- Expansion of existing observational systems to fill identified gaps
- Deploy new technologies such as scientific instrumentation on deep-ocean telecommunications cables
- Wide expansion of data access, availability and analysis capability for real-time and near-real time sea level, seismic and GNSS-derived land motion data
- Increase access and regularly update the collection of coastal topographic and bathymetric data as well as high performance computational capabilities
- Ensure all National Tsunami Warning Centers have access to data, tools and communication platforms, protocols and training to timely and effectively warn coastal and maritime communities threatened by tsunamis and other coastal hazards and are integrated into a multi hazard framework

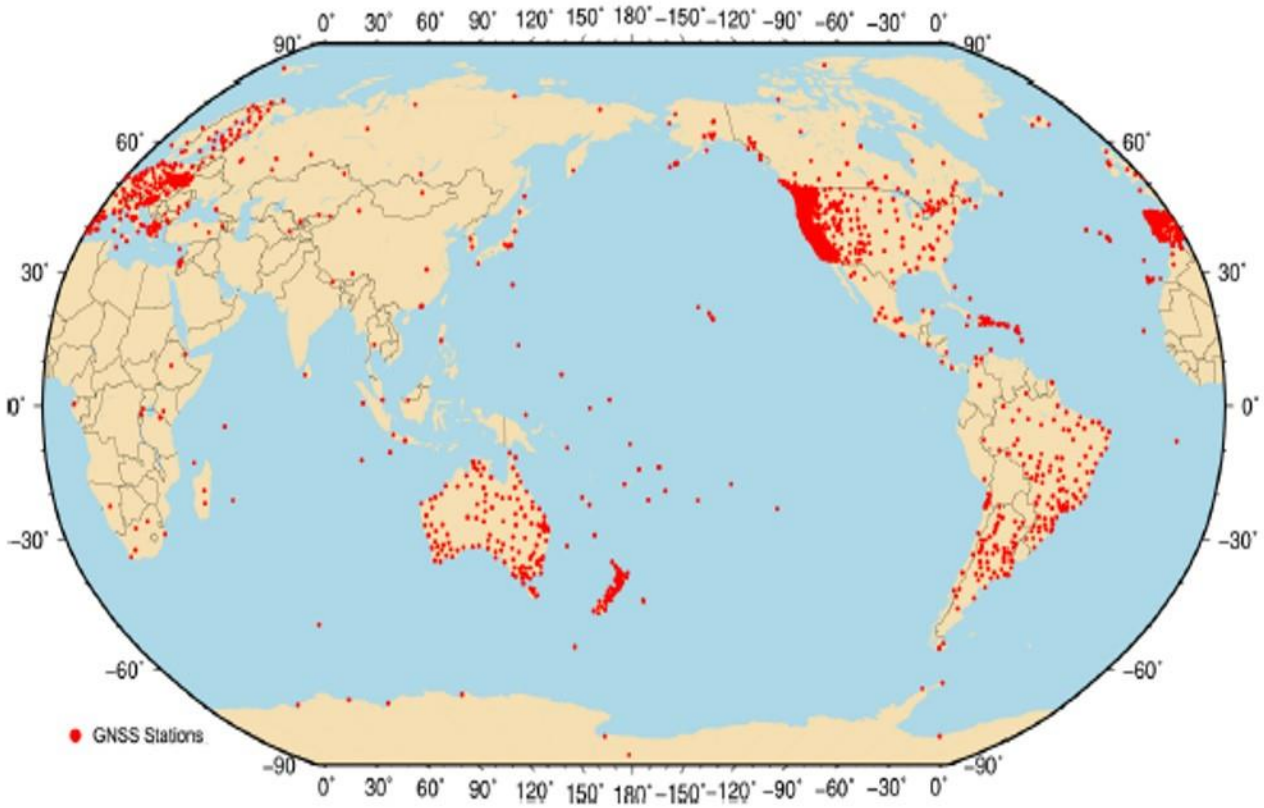
NEW POTENTIAL SOURCES OF SEISMIC AND GNSS OBSERVATIONS FOR TSUNAMI WARNING SYSTEMS

Locations and magnitudes of historical seismic events (red), DART tsunami buoys (yellow triangles) and current (green) and planned (white) submarine cables,. SMART repeaters shown every 300 km



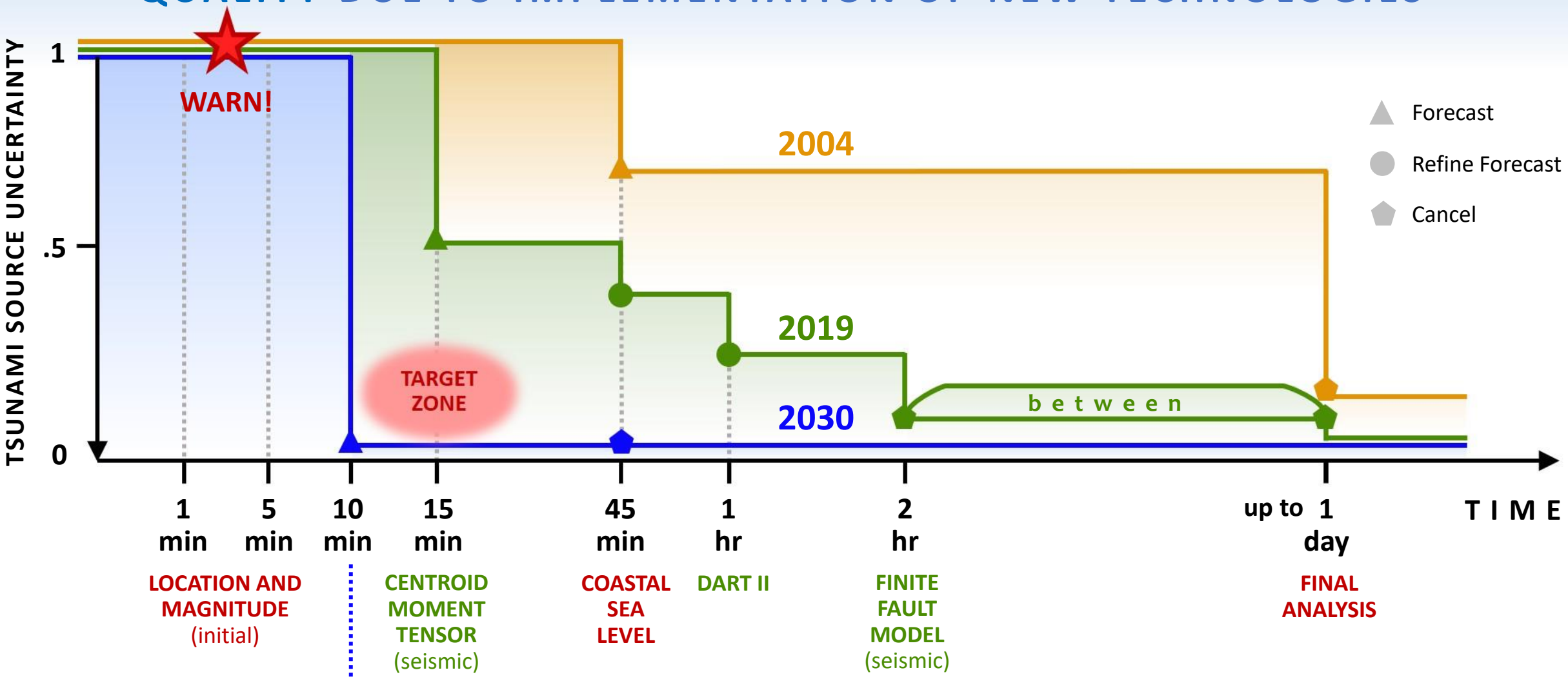
Angove, M . et. al, 2019

The location of 2,260 real-time GNSS stations from public networks around the world



Pacific Northwest Geodetic Array/Central Washington University

EXPECTED IMPROVEMENT IN TSUNAMI FORECAST TIME AND ITS QUALITY DUE TO IMPLEMENTATION OF NEW TECHNOLOGIES



- Centroid Moment Tensor (GNSS)/Finite Fault Model (GNSS)
- Full Bottom Pressure (eg. Tsunameters, Cables, dedicated observatories)
- In-situ Accelerometers

Data Availability 2004—2030

Angove et. all, 2019

OCEAN DECADE TSUNAMI PROGRAMME:
Planning Overview

- RESEARCH
- PILOT PROJECTS EXPERIMENTS
- NEW DETECTING SYSTEMS
- ARTIFICIAL INTELLIGENCE
- OUTREACH
- EDUCATION
- MULTI-HAZARD
- TSUNAMI READY

The four ICGs will perform regional Steering Committee functions

A special Coalition for Tsunami Ready will be established in collaboration with other critical stakeholders

MEMBER STATE CONTRIBUTIONS IDENTIFIED AND APPLIED

The Scientific Committee will be tasked to develop a Draft 10-Year Research, Development and Implementation Plan for the programme for endorsement by the TOWS-WG at its next session

The TOWS-WG will perform Global Steering Committee functions for the programme

A Scientific Committee with an advisory role for the duration of the programme will be established

OCEAN DECADE TSUNAMI PROGRAMME:

THE MAIN SOCIAL OUTCOME

TO MAKE 100%

OF COMMUNITIES AT RISK OF TSUNAMI PREPARED FOR AND RESILIENT TO TSUNAMIS

BY 2030

THANK YOU FOR ATTENTION!

QUESTIONS?