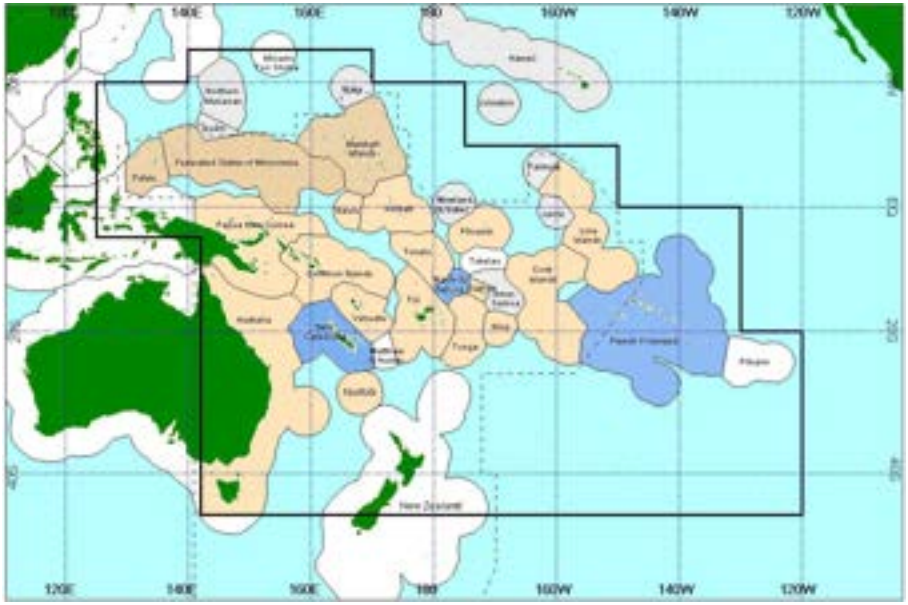
Ocean Observing systems in the Pacific



Jerome Aucan, IRD, New Caledonia

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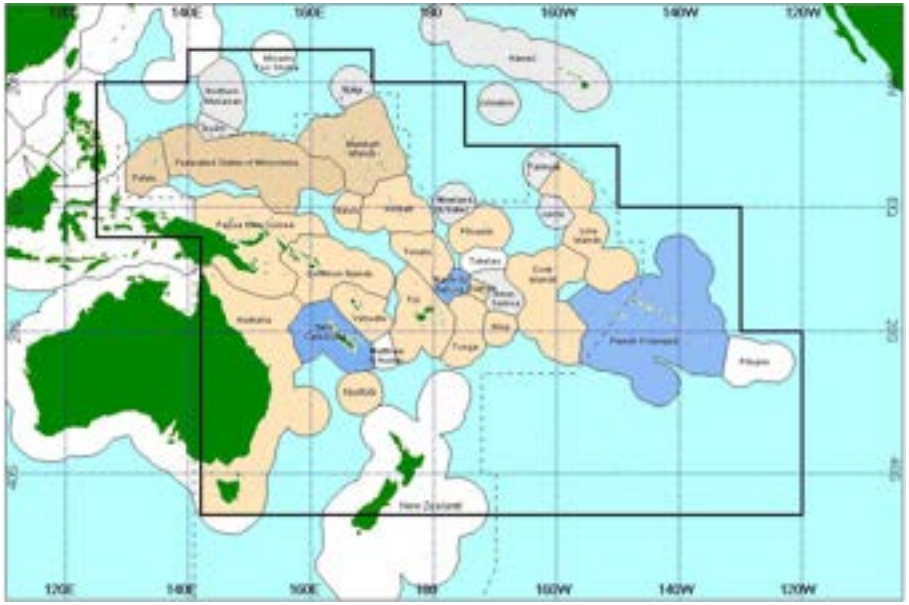
- **Small islands states, Large EEZs, -> Large ocean states**
- **Offshore and coastal (lagoon and reef) resources**
- **High biodiversity**



➢Highly vulnerable countries to environmental changes, natural hazards and human activities, due to high population growth in small areas, exploitation of resources, development of invasive species;

➢Already impacted by climate change due to physical (location, geology) and socio-economic (smallness, isolation) factors. This concerns low-lying islands and nations that are entirely atolls (Tuvalu, Kiribati, Tokelau and Marshall Islands), but also high islands.

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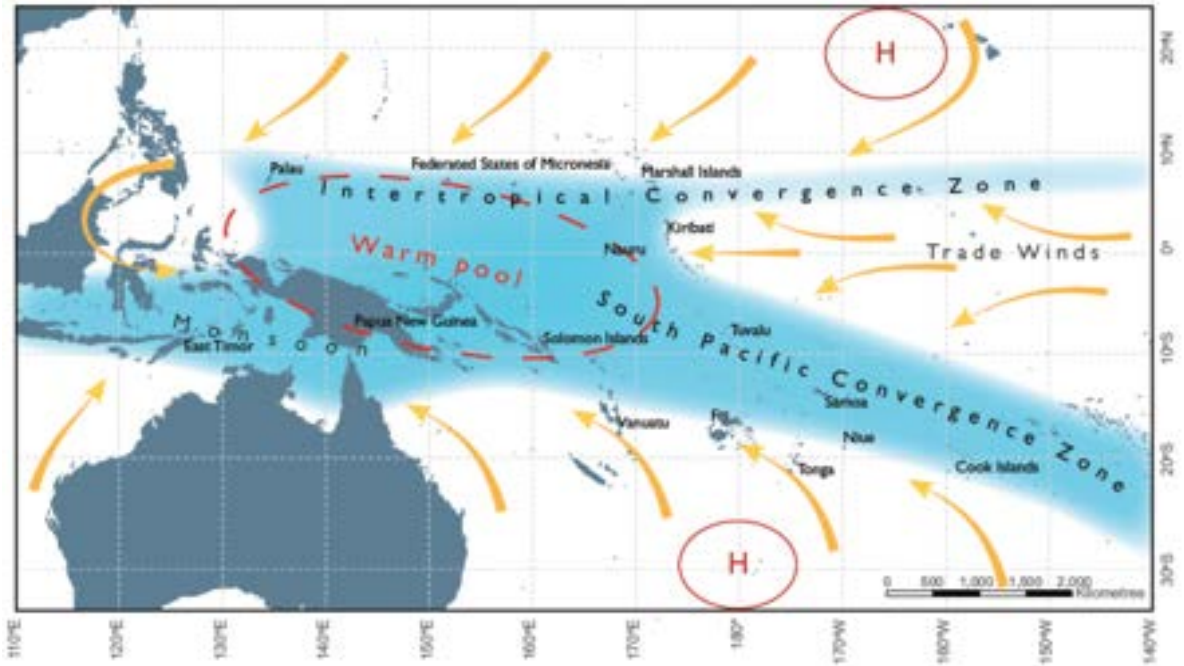
The Pacific is home of major environmental phenomena related to ocean-atmosphere dynamics.

The **SPCZ**, one of the most powerful convective engines on our planet, influences climate on inter-annual (**ENSO**) to multi-decadal scale....



....with consequent effects on population, infrastructure, biodiversity, food (migration of Tuna stock etc.)

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GOPS

USP
THE UNIVERSITY OF THE SOUTH PACIFIC

IRD
Institut de recherche pour le développement

11-12 June 2015, IRD Centre Nouméa (New Caledonia)

PACENET Workshop focused on three areas of research:

- CC and variability, oceanography, ocean atmosphere interaction,
- impacts of CC on marine and terrestrial ecosystems & biodiversity,
- impacts of CC on societies and communities

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Recommendations for CC and variability, oceanography, ocean atmosphere interaction **:**

The group recognised the importance of the Pacific Ocean as one of the main actor of climate change. Likewise, it recognises that any changes of the Pacific water masses will have global impact. Monitoring of the ocean is required. Because of it extraordinary large dimension, the Pacific Ocean need both specific and innovative.

Therefore the group recommends:

- Hold regular meetings/workshops, such as the one organised by the PaceNetPlus programme and the Science Technology and Research (STAR) meetings or SPC-SOPAC.
- Retrieve historic and analogue data, incl. identifying non-functioning monitoring sites.
- Develop coastal monitoring for multi-hazard mitigation, forecasting and coral reef conditions.
- Increase and develop both surface and vertical open-ocean data acquisition, in particular w.r.t monitoring of ocean acidification and carbon cycle.
- Sustain and reinforce measurements from ships of opportunity.
- Establish long term mooring timeseries and ship surveys.
- Seek Pacific Island leaders support (forum, Pacific Met Council).
- Identify focal points in countries.

2nd DBCP workshop held in Noumea

Second Pacific Islands Training Workshop on Ocean Observations and Data Applications

Data Buoy Cooperation Panel (DBCP) and Pacific-Islands

24 - 27 May 2016

IRD Noumea Centre, New Caledonia

Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)

Second Pacific Islands Training Workshop on Ocean Observations and Data Applications (PI-2)

WMO/IOC Data Buoy Cooperation Panel (DBCP) and Partners

23-27 May 2016
Venue: IRD Centre
Nouméa, New Caledonia

Please join Workshop from your computer, tablet or smartphone
https://global.gotomeeting.com/join/524270258
Presentations will be recorded for IOC Ocean Teacher Global Academy (OTGA)

Kindly Hosted By:
Institute for Research and Development (IRD), France

Generously Sponsored By:
ThePacific Community (SPC), New Caledonia Meteorological Service, South Pacific Observatory (GOPS), EU- PACENET-plus, Pacific Island Global Ocean Observing System (PIGOOS), Secretariat of the Pacific Regional Environment Program (SPREP), Australia's Integrated Marine Observing System (IMOS), the Australian Bureau of Meteorology's Climate and Oceans Support Program in the Pacific (COSPPac), China's National Center of Ocean Standards and Metrology of (NCOSM), World Meteorological Organization (WMO)/Intergovernmental Oceanographic Commission (IOC), USA National Oceanic and Atmospheric Administration (NOAA) Office of Climate Observation (OCO).

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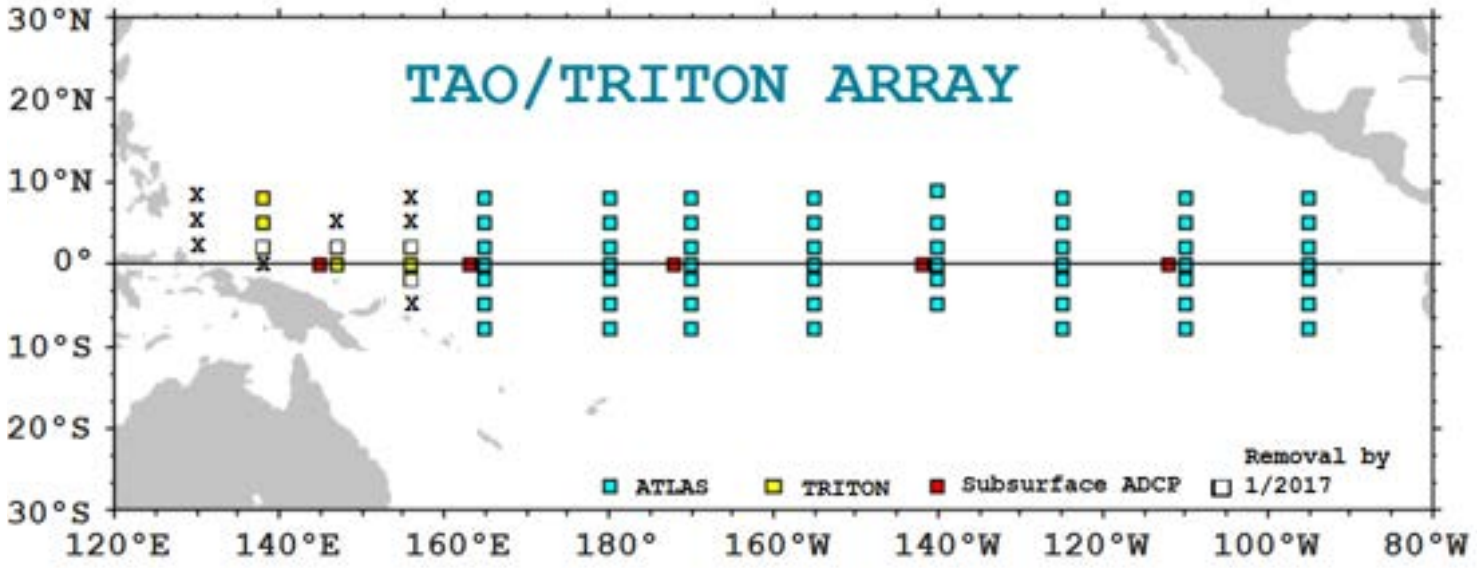

The TAO-TRITON system is vulnerable - stations marked by an 'X' have already been removed.

TPOS2020 goal: to redesign the TPOS to observe ENSO and advance understanding of the tropical Pacific physical and biogeochemical variability and predictability

TPOS2020 perspective (in addition of Argo)
- Extension of moored array toward the tropics (… SPCZ in SW Pacific)
- Biogeochemical observations

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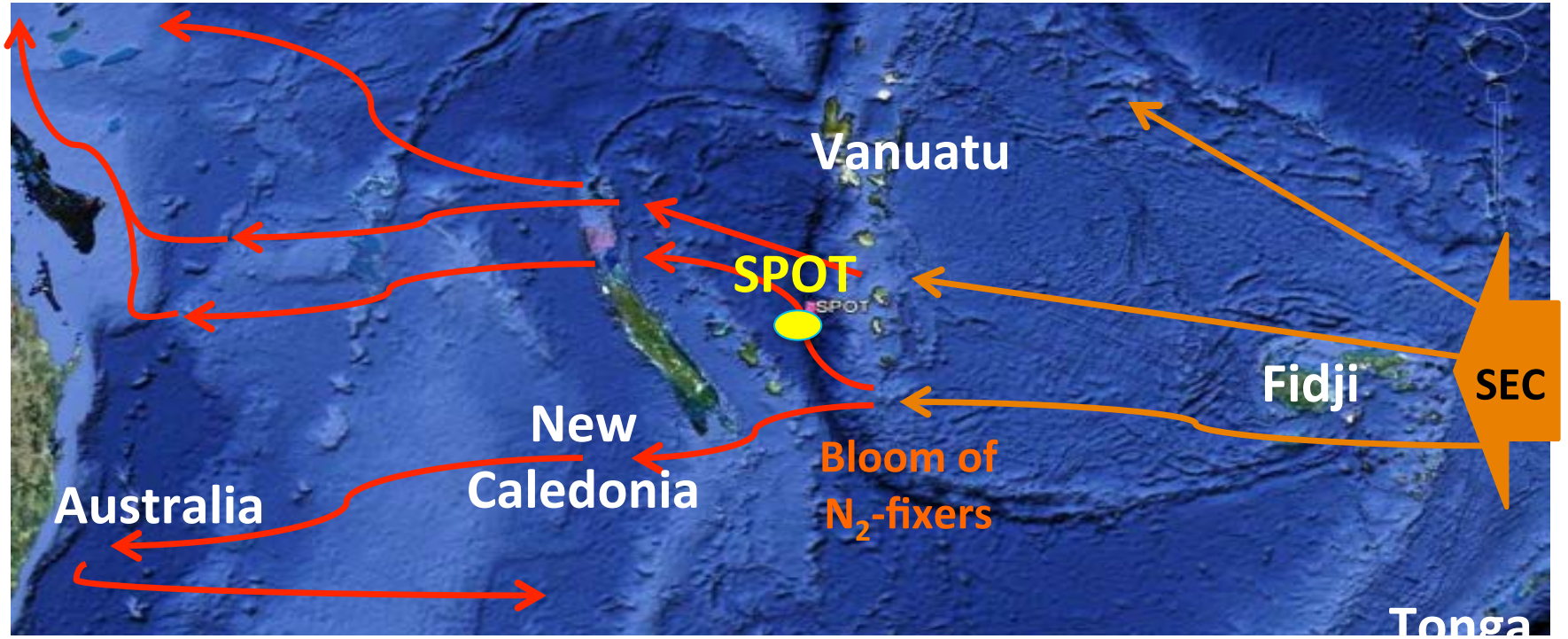
- On the way of the South Equatorial Current (SEC)
- Spectacular blooms of N_2-fixers (Diazotroph, *Trichodesmium*) possibly increase the plankton productivity and thus the biological carbon pump



Open ocean station in southern hemisphere : 168°E, 20°S, 4 cruises/yr since 2012, Physical and biogeochemical parameters, Moorings needed

A plan for **multihazard coastal vulnerability monitoring and warning system for the Pacific Islands**.

Rationale :

- Decadal Sea-level rise will increase the severity and frequency of extreme sea-level and inundation events.
- Extreme sea-level and inundation events can be due to a combination of :
  - **Storm surge (cyclone and high waves inundation.**
  - **Astronomical tides (king tides).**
  - **Tsunamis.**

Objective

-Goal : Create a **Multihazard coastal vulnerability** monitoring and warning system.

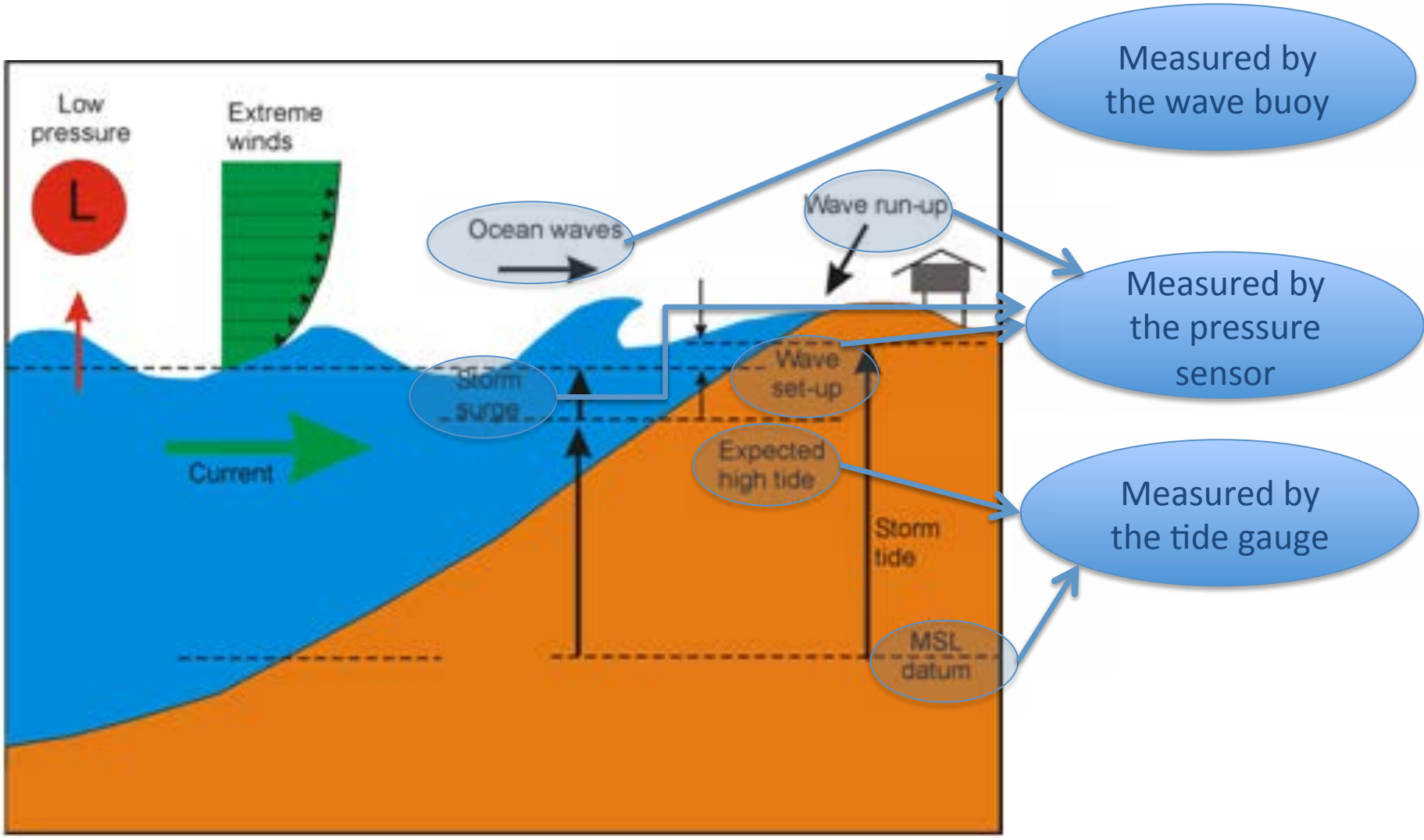
-How : Combine existing and future waves and sea level monitoring systems into a unified system for Pacific Island countries. More product based than a data portal (Cf PacIOOS inundation products).

-What : **Tide gauges, Pressure sensors, wave buoys** and modeling

-Who : PICs meteorological and maritime services, technical experts, CROP agencies and neighboring countries.

-Why : This system would partly fulfill Pacific Key outcome (PKO 4 and 7) of the Pacific Islands Meteorological Strategy.

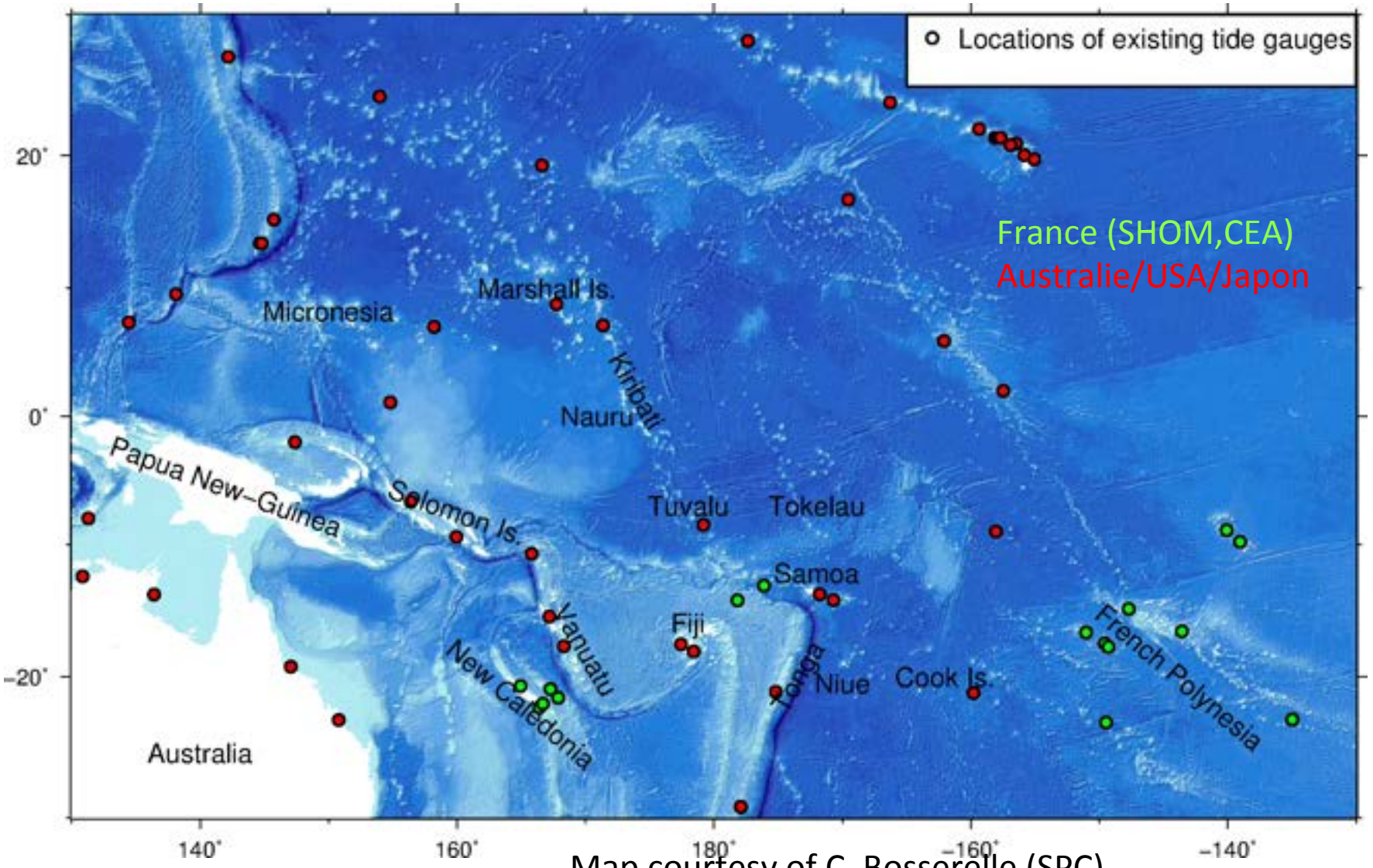
Rationale


Low pressure
L
Extreme winds
Ocean waves
Wave run-up
Measured by the wave buoy
Measured by the pressure sensor
Storm surge
Wave set-up
Current
Expected high tide
Measured by the tide gauge
Storm tide
MSL datum

Benefits

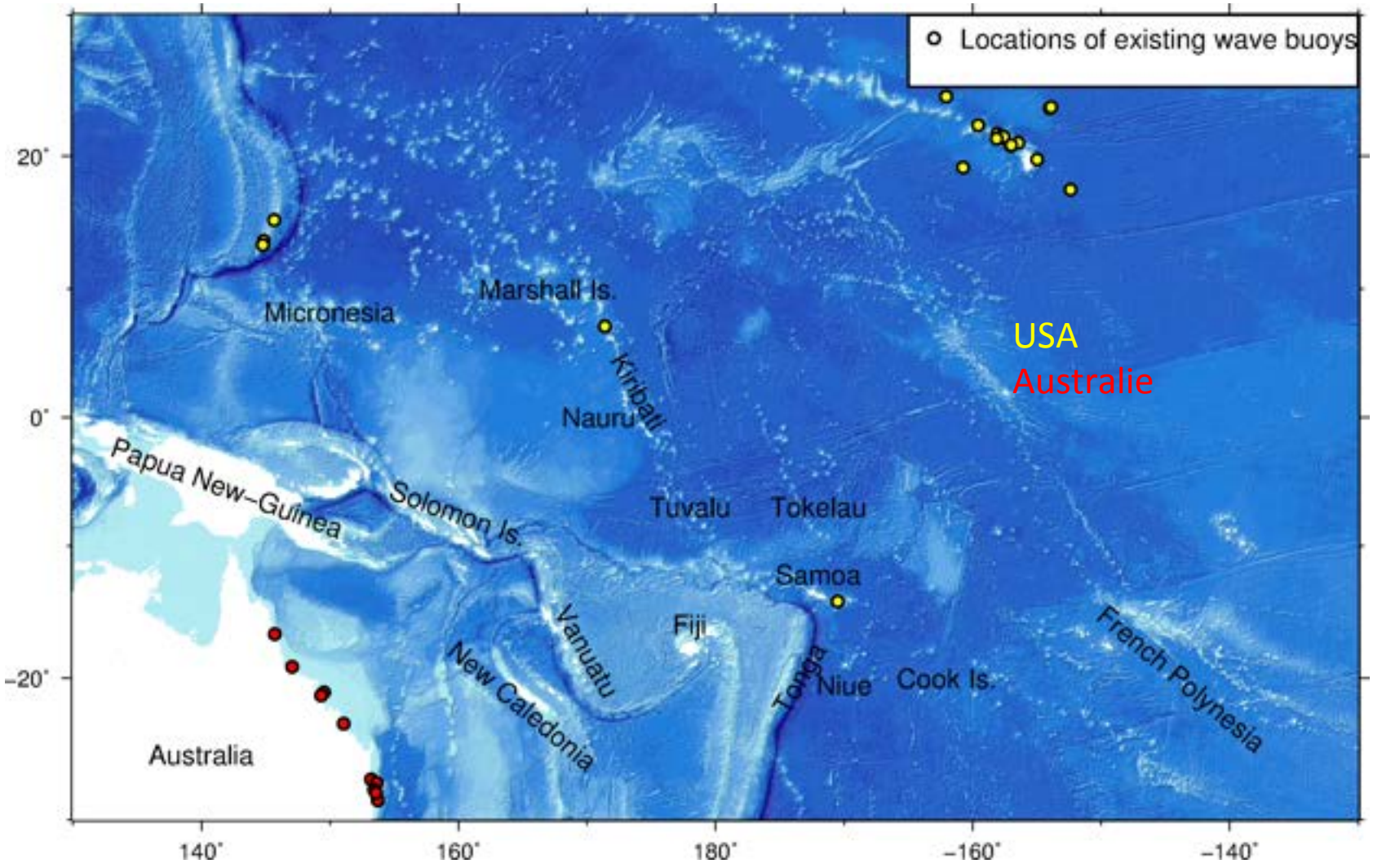
- Leverage on existing network and capacity.
- Improve capacity building in PICs for Climate monitoring (Wave buoys are relatively easy to deploy, similar to FADs already in use in PICs).
- Improved regional collaboration in terms of data sharing (similar to ORSNET seismic data network).
- Multi hazard approach to coastal vulnerability (Including king tides, storm surges, high surf and tsunamis).
- Initial instrumentation of study site to encourage detailed process studies.
- Wave buoys can also be equipped with other scientific sensors such as pH sensors to monitor ocean acidification.

Tide gauges in the Pacific



Map courtesy of C. Bosserelle (SPC)

Wave buoys in the Pacific.



Map courtesy of C. Bosserelle (SPC)

Pressure Sensors network

- Pressure sensors along exposed coastlines measures simple wave characteristics, inundation levels and tsunamis.

- IRD/GOPS : Existing temperature sensor network in the SouthWest Pacific
- IRD/GOPS : Emerging pressure sensor network in New Caledonia,

Thank you