



# Plan for a Regional Upper Air Observing Network for the South Pacific

*9-12 October 2017, Nadi, Fiji.*

**Prepared by GCOS & WIGOS with the assistance of the  
Pacific Island States**



WMO



IOC



International  
Science Council

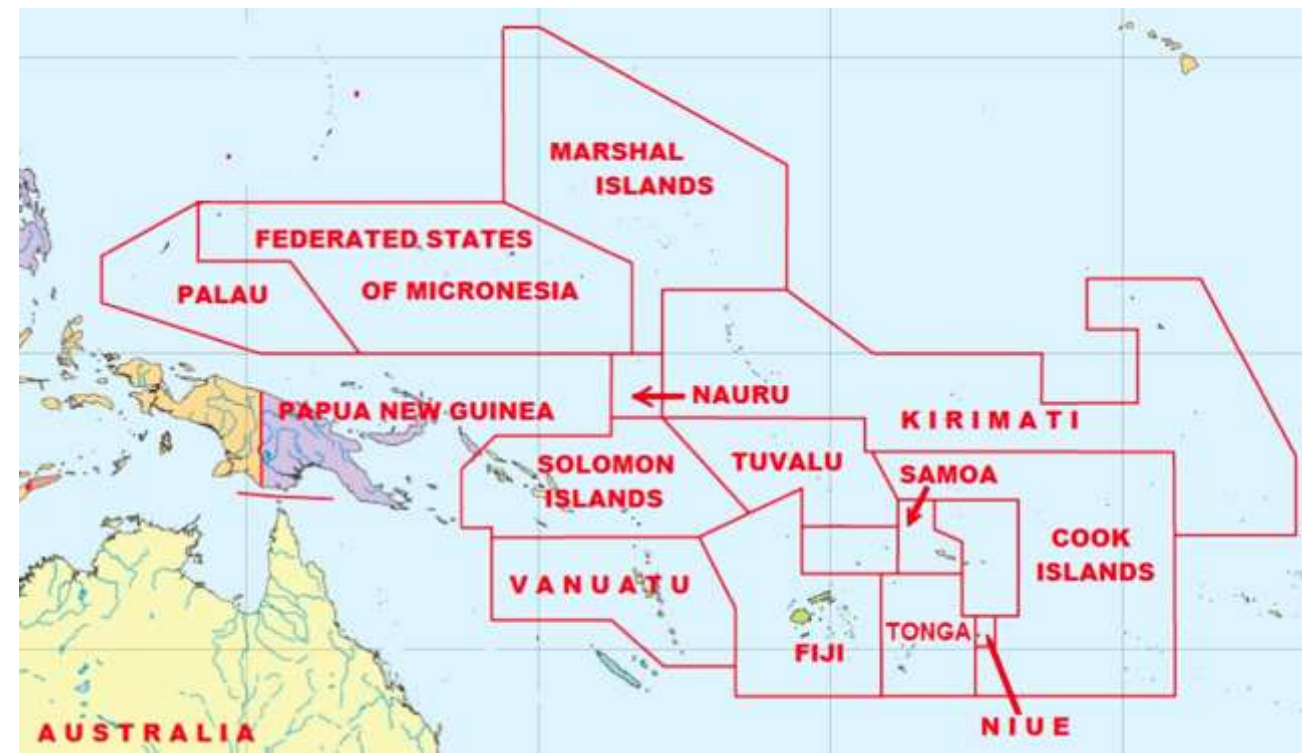


# 2016 UNFCCC supported improving observations:

- decision 19/CP.22
  - *the need to maintain, strengthen and build capacities for climate observations...*
  - *Encourages **Parties to work towards the full implementation** of the [GCOS] implementation plan ...*
  - *Invites **United Nations agencies and international organizations to support the full implementation** of the [GCOS] implementation plan...*
- SBSTA 45 conclusions (FCCC/SBSTA/2016/4)
  - *noted the **need for regional workshops**, as identified by the GCOS 2016 implementation plan, [...] and invited the GCOS to organize such workshops, taking into consideration the benefit of organizing these workshops in collaboration with relevant partners*
  - *also encouraged Parties and relevant organizations to strengthen and maintain observation networks and capabilities in all countries, especially in developing countries, including the LDCs and **small island developing States***

# Joint GCOS – WMO Integrated Global Observing System Workshop for the Pacific Small Island Developing States (SIDS)

- From most islands nations
- Held jointly with the WMO Integrated Global Observing System (WIGOS) and GCOS, 9-12 October 2017, Nadi, Fiji
- Hosted by the Fiji Meteorological Office
- Supported by The Secretariat of the Pacific Region Environment Programme (SPREP)



Fiji Meteorological Service  
RSMC Nadi-Tropical Cyclone Centre  
"Official source of reliable 'first-look' information on tropical cyclones occurring in the South-West Pacific Ocean. All products on this site are on Fiji Standard Time + (UTC + 12:00)  
Fiji Daylight Saving Time (DLST) + (UTC + 13:00)

ISO 9001:2008 certified provider of Aviation Meteorological Services



- Upper Air measurements
  - **Systematic upper air observations, lead to global benefits**, underpinning forecasting and climate reanalyses which form the basis of much of our understanding of climate and climate change;
  - These observations in the Pacific region have the **highest impact, of all ground-based measurements**, on the global quality of weather and climate analysis and prediction.
  - Both the spatial density and observing frequency currently fall short of GCOS and WMO requirements and a beyond the resources of SIDS.
- Precipitation
  - Changes in extreme events are significant impacts of climate change
  - Water related issues are significant adaptation challenges in most countries (floods, droughts, storms, and in islands rising sea level and salt water intrusion)

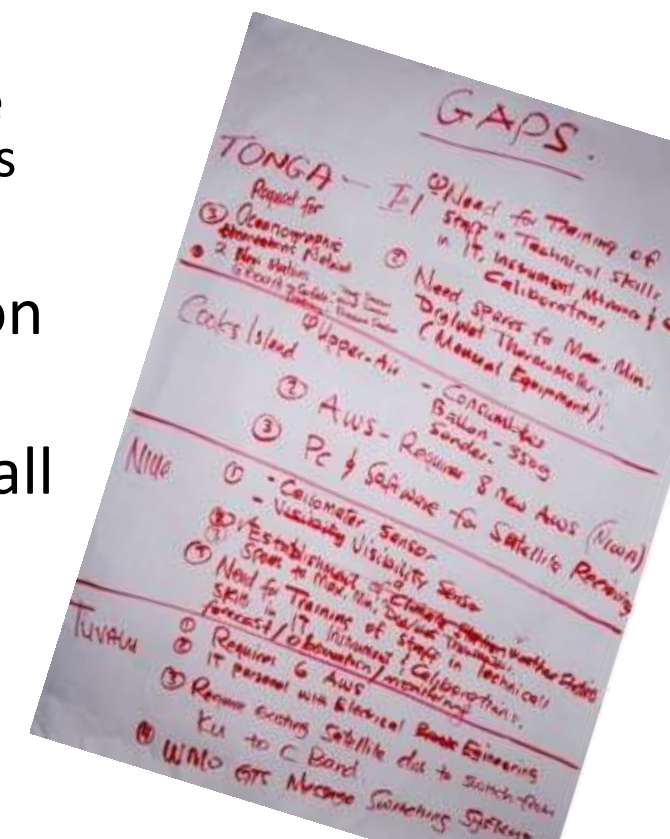
	Land Area	Area of EEZ	Population	GDP	GDP per km <sup>2</sup>	Population Density including EEZ	Pacific Islands
	km <sup>2</sup>	million km <sup>2</sup> including land area	thousands, UN Estimate for 2017	World Bank. 2016, US\$	US\$ per km <sup>2</sup>	km <sup>2</sup> per person	
Cook Islands	240	1.80	17	311 <sup>a</sup>	0.00017	0.01	
Federated States of Micronesia	702	3.00	106	322	0.00011	0.04	
Fiji	18,274	1.30	906	4632	0.00360	0.70	
Kiribati	811	3.44	116	166	0.00005	0.03	
Marshall Islands	181	1.99	53	183	0.00009	0.03	
Nauru	2	0.31	11	102	0.00033	0.04	
Niue	26	0.39	2	10 <sup>b</sup>	0.00003	0.00	
Palau	535	0.60	22	293	0.00048	0.04	
Papua New Guinea	45,258	2.87	8,251	16929	0.00590	2.88	
Samoa	283	0.13	196	786	0.00600	1.50	
Solomon Islands	2,799	1.62	611	1202	0.00074	0.38	
Tonga	72	0.66	108	395	0.00060	0.16	
Tuvalu	3	0.75	11	34	0.00005	0.01	
Vanuatu	12,300	0.68	276	774	0.00110	0.41	
<b>Total above</b>	<b>81,486</b>	<b>20</b>	<b>10,687</b>	<b>26,139</b>	<b>0.00130</b>	<b>0.55</b>	
USA	9,525,067	11.35	325,958	18,569,100	1.60	28.72	Cook Islands
Japan	377,930	4.48	126,670	4,939,384	1.10	28.28	



Tuvalu



- Upper air
  - Some upper air observations have ceased (the radiosondes now operational apart from Fiji are those with external funding)
  - Main reason for stopping is lack of resources for consumables and maintenance.
- Precipitation
  - Precipitation measurements may not be representative and more sites are needed to cover all islands to address drought and floods
- Remoteness of many islands increases costs, makes maintenance more difficult and exacerbates communication issues
- Procurement is a issue with lack of expertise, relatively small quantities and remote locations all increasing the costs
- Capacity building needs to be addressed



# Global importance of upper air observations

- The ECMWF Deputy Director of Forecasts noted in September 2017 regarding the potential value of rehabilitating the upper air network over Papua New Guinea:

*“Radiosondes in PNG can ... help predict when Rossby wave trains may be triggered from that area, and then propagate across the Pacific to N. America, and where they influence the mid-latitude storms tracks and ultimately the weather in Europe”*

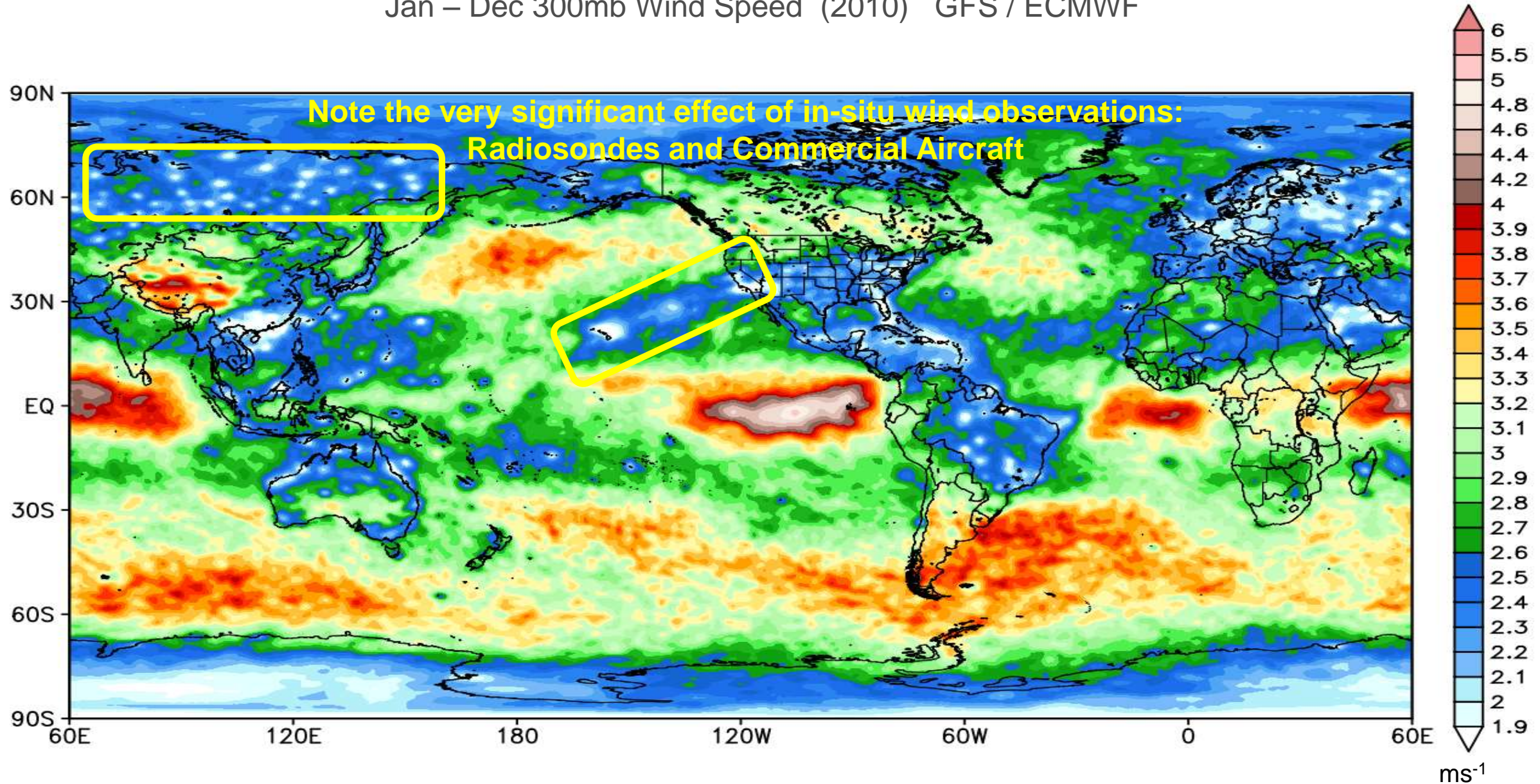
*“Isolated radiosondes are individually much more valuable and bring much more benefit to forecast quality than observations in a dense network (benefit per station that is!)”*

- ***These considerations led directly to development of Global Basic Observing Network (GBON) as key component of WIGOS (see separate presentation)***



# Root-Mean Square of Analysis Differences: 300mb Wind Speed

Jan – Dec 300mb Wind Speed (2010) GFS / ECMWF



SOURCE: Langland et al.; from 5<sup>th</sup> WMO Impact Workshop, Sedona 2012



# Workshop Key Outcomes

- **Systematic upper air observations, lead to global benefits,** underpinning forecasting and climate reanalyses which form the basis of much of our understanding of climate and climate change;
- These observations in the Pacific region have the **highest impact, of all ground-based measurements,** on the global quality of weather and climate analysis and prediction.
- Both the spatial density and observing frequency currently fall short of GCOS and WMO requirements and a beyond the resources of SIDS.
- Given that most of the area is water a **WMO spatial requirement (500km) is unachievable** and a relaxed resolution of 1000km should be considered.
- **These observations are a global good and therefore the upper air network over the South Pacific therefore needs sustained international support.**
- Support should be based on **transparent processes** and a commitment to **free and open data sharing** in accordance with WMO Resolutions 40 and 60 and the GCOS Monitoring Principles.
- Ensuring **sustainability is of paramount importance.**



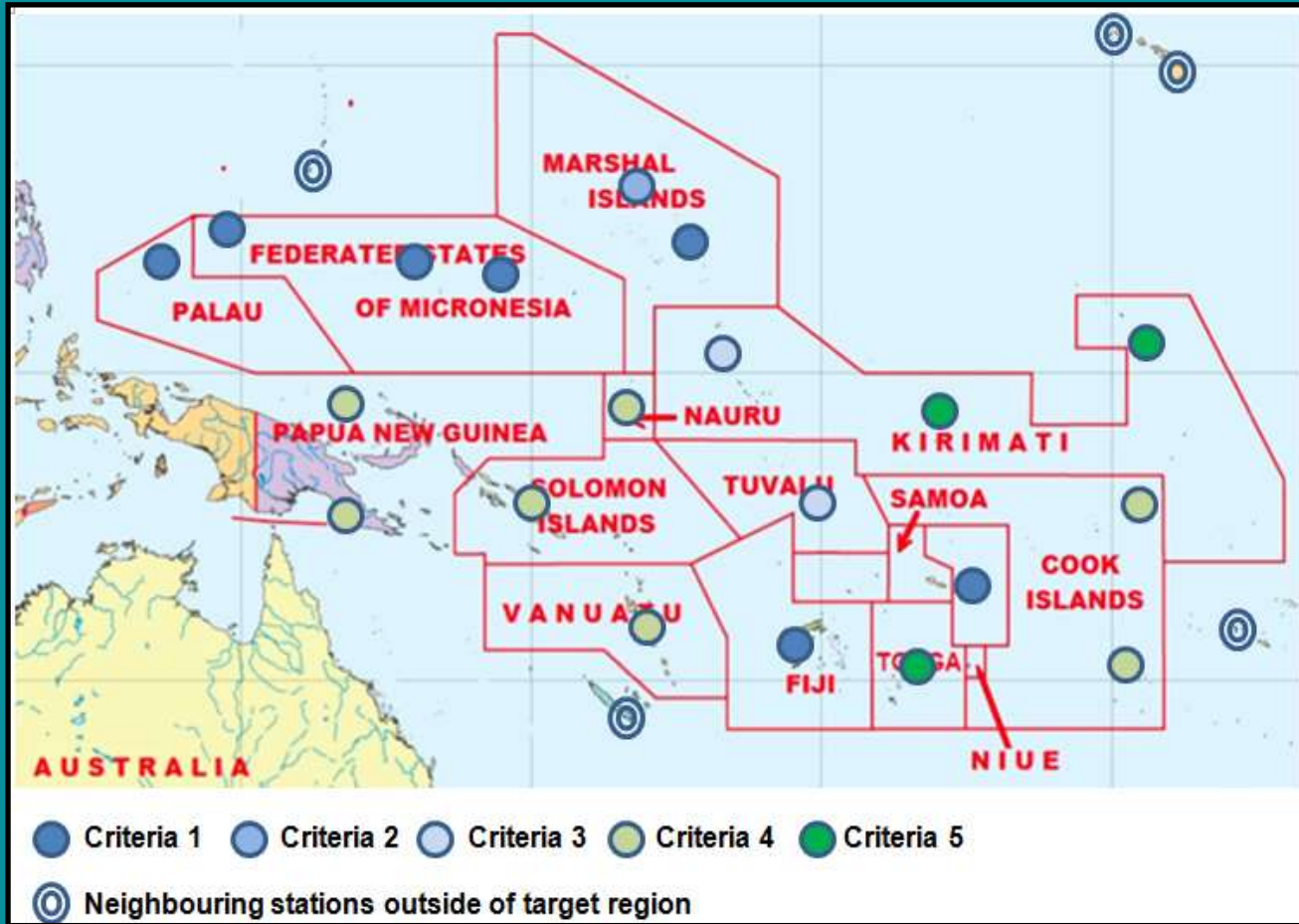
# Considerations included in the plan

- **Sustainable funding for upper air measurements is needed**, acknowledging this is beyond the capabilities of the individual countries in the region and will provide global benefits
- **Communications.** Many of the islands are remote and communications are not straightforward. “Chatty Beetles” provide a suitable option and their use should be encouraged.
- **Transport.** The distances involved and the need to use infrequent ships mean that repairs and maintenance are often delayed and the distances lead to additional costs.
- **Precipitation** is an important parameter both in mountainous islands where issues include flooding and drought, and atolls where drought and sea water intrusion are large concerns.
- **National precipitation observations** are often insufficient and unrepresentative. Typical metrological stations do not reflect the variable nature of precipitation on many islands and simpler, cheaper voluntary observing systems should be considered to address some of these needs.
- **Assistance** in procurement to ensure cost-effective solutions are purchased that meet requirements specified by WMO is needed. A joint purchase of equipment and consumables for several countries is may be part of the solution.
- **Training** is a vital part of ensuring sustainability. Suitable facilities to do this are available in Samoa (SPREP) and Fiji (the Metrological Office).



- Would cost about 14 million Euro for 10 years and has three elements:
  - 20 operational upper-air stations across the region across 13 countries reporting 2 times a day and covers:
    - Site establishment, repairs and/or replacement as needed,
    - Consumables and other running costs
    - Maintenance
    - Training
  - Upgrading one station to be a reference site, providing traceable high-quality data and becoming a centre of expertise for the regional network.
    - Site would become part of “GRUAN” – the GCOS Reference Upper Air Network
    - It is suggested that the site at Nadi Airport, Fiji should be the reference site
  - Establishment and operation of a regional network of operators with on-going training, and exchange will increase the sustainability of the network.
    - Workshops and meetings
    - Training and Capacity Building
  - Countries will provide sites and suitable staff

# The Proposed Network




- 20 sites proposed to meet relaxed WMO (OSCAR) and GCOS requirements
- The site at Nadi Airport, Fiji is proposed to become the reference station
- Fiji is also a good location for training due to its existing facilities and good air links and

Criteria reflect differing effort needed for stations to become operational. Criteria 1 sites are those that are currently reporting twice a day. Only Fiji does this without external support

- This plan
  - Requires a modest amount of funding (less than 1.4 million Euro/year)
  - Will improve numerical weather forecasts and climate projections globally in addition to local benefits
  - Given limited local resources, and the areas to be covered, global funding is needed
  - Covers not just capital costs but also running costs, consumables, maintenance etc.
  - This will be a key regional implementation effort in support of the Global Basic Observing Network (GBON), an initiative launched by WMO EC-70 to ensure world-wide, continued, real-time access to an adequate supply of surface-based observation with global coverage for critical global NWP and climate analysis systems.



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SOURCE: ESA



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