Regional Tide gauge network report of French Polynesia
(South central Pacific Ocean)

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General context

French Polynesia is composed with 118 atolls and islands distributed over 5 major volcanic chains (from north to south the Marquesas archipelago, the Tuamotu oceanic plateau with its 69 atolls, the Society, the Cook-Austral and the Gambier chains of islands and atolls; ***see Figure 1***), each of which has been related to drift of the Pacific hotspots plate over hotspots. Its Exclusive Economic Zone (EEZ) is one of the largest in the Pacific Ocean with its 5 millions of km².

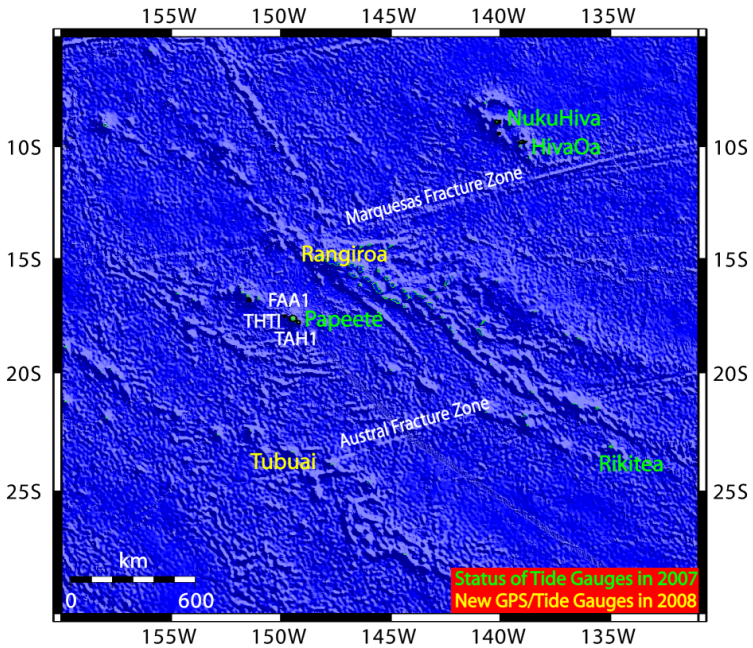

Figure 1 : Location of tide gauges and GPS stations.
THTI and TAH1 are located at the Tahiti Geodetic Observatory, PAPE at the harbour of Papeete, and FAA1 at Faa'a Airport

Archipelago	Population
MARQUESAS	8 658
TUAMOTU-GAMBIER	16 896
SOCIETY	227 848
AUSTRAL	6 304
TOTAL	*259 706*

Table 1. : Repartition of the French Polynesian population from the ISPF census in 2007.

Tide gauge network status in 2007

Four tide gauge stations are currently operated in French Polynesia ***(see Table 2)***. Three of them were implemented and are maintained by the University of Hawaii :

- Papeete-harbour in Tahiti Island (Society Archipelago) since 1969;
- Rikitea Island (Gambier Archipelago also named Mangareva), since 1969;
- and Nuku-Hiva, since 1987

The fourth tide gauge, installed in HivaOa Island (Marquesas Archipelago) in 2003, is owned by the Commissariat à l'Énergie Atomique (CEA - Laboratoire de Géophysique de Pamatai).

For information, the Matavai Bay station located in Papeete Tahiti Island was operated from 1957 to 1999 by SHOM (French Marine Department).

Station Name	Code	GLOSS number	Owner	Type	GPS/D.A.	Latitude	Longitude	Comment
Hiva Oa Is., Marquesas Archipelago	HIVA	Non-available	CEA	Pressure	No	-9.8047	-139.0344	Contact : Dominique Reymond reymond.d@labogeo.pf
Nuku Hiva Is., Marquesas Archipelago	NUKU	142	UHSLC	Pressure, Radar	No	-8.9213	-140.0953	Contact : Pr. Mark Merrifield markm@soest.hawaii.edu - Connected to GOES
Papeete, Tahiti Is., Society Archipelago	PAPE	140	UHSLC	Pressure, Radar	Yes/Phone	-17.5330	-149.5670	
Rikitea, Tuamotu-Gambier Archipelago	RIKI	138	UHSLC	Pressure, Radar	No	-23.1333	-134.9500	

Table 2. : Information on the tide gauge network in 2007.
D.A. : Data availability

Station Name	Code	GLOSS number	Owner	Type	GPS/D.A.	Latitude	Longitude	Comment
Rangiroa Atoll, Tuamotu Archipelago	NYA	TBD	UPF	Radar	Yes/FlashCard	-14.9458	-147.7060	Contact : Pr. Jean-Pierre Barriot jean-pierre.barriot@upf.pf - Connection to GOES to be planned - Pressure sensor planned to be installed in 2009
Tubuai Is., Austral Archipelago	NYA	TBD	UPF	Radar	Yes/FlashCard	-23.3418	-149.4755	

Table 3 : Extension of the tide gauge network by UPF since 2008.
D.A. : Data availability; NYA : Not yet available; TBD : To be determined

The extension of the tide gauge network with the POGENET project

Since 2006, the Laboratory of Geosciences of the South Pacific of the University of French Polynesia (GEPASUD-UPF) has initiated the POGENET project (Polynesian Geodetic Network) and has deployed, under an agreement with CEA/LDG, SHOM, and the Civil Protection department, thanks to a grant from French and Polynesian research offices, two GPS/tide gauges, one in Tubuai Island (Australs archipelago) and the other in Rangiroa atoll (Tuamotu archipelago). Both have been implemented in 2008 ***(see Table 3)***.

Beginning 2009, the laboratory GEPASUD-UPF, to extend the POGENET project, has presented a grant application entitled "a Polynesian Observatory for Global Warming monitoring through a local network of GNSS and tide gauges instruments" to obtain additional funding for two years from the French and Polynesian research offices. The laboratory is linked to the Geodetic Observatory of Tahiti (MOBLAS SLR, GPS and DORIS tracking stations, a gPhone microgravimeter) which was co-funded in 1997 by CNES, NASA and UPF. An experimental low-cost tide gauge will be tested in the Peninsula of Tahiti and the tide gauge of Nuku-Hiva (Marquesas archipelago) will be complemented by a permanent GPS receiver. Depending on the new grant, we will build a new GPS/tide-gauge station in Akamaru Island (Tuamotu-Gambier).

In French Polynesia, the tsunami hazard is considered as a serious threat and the initial project received the support of the Civil Protection Department as it also permits the monitoring of tsunami waves. Since 1837, 14 tsunamis originating from the Pacific rim hit French Polynesia, 10 of them caused damage. Among these earthquakes, the 1946 Aleutian and 1960 Chilean strongest ones affected most of the Polynesian archipelagos. For the Society archipelago, the risks in Tahiti, Moorea, and Huahine Islands are quite high, whereas other islands and atolls are moderately exposed. The Gambier has possibly an elevated exposure when referring to historical data. The Civil Protection Department is planning to set up an additional tide gauge station in Bora-Bora Island or possibly in Huahine Island (Society archipelago), but without providing GPS receivers.

Regional, national and international collaborations

CEA - Laboratoire de Géophysique :

M. Dominique Reymond, director
CPPT (Centre Polynésien de Prévention de Tsunamis)
BP 640 Papeete
98713 Tahiti – Polynésie française
E-mail : reymond.d@labogeo.pf

- Global assessment of the tsunami hazard in French Polynesia and modelling of tsunami
- Estimation of oceanic swell using micro-gravimetry on tide gauge sites

SHOM (French Marine Department):

M. Yann Dupont
Base marine de Papeete
SP 91300 00201 Armées
SHOM – Papeete Tahiti
E-mail : yann.dupont@shom.fr

- Technical assessment in tide gauge installation with state-of-art

Protection civile (Civil protection department) :

M. David Grafeille
Service interministériel de défense et de protection civile
BP 115 Papeete
98713 Tahiti – Polynésie française
E-mail : david.grafeille@polynesie-francaise. pref.gouv.fr

- Tsunami hazard assessment

CNES/GRGS-SHOM :

Dr. Richard Biancale
Observatoire Midi-Pyrénées
14, avenue Edouard Belin
31400 Toulouse
E-mail : richard.biancale@cnes.fr

- Study of sea level variations using GPS/tide gauges and crustal deformations.

Institut du Littoral et de l'Environnement (ILE) :

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Université de La Rochelle
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17 000 La Rochelle
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- Study of sea level variations using GPS/tide gauges

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E-mail : sdwil@pol.ac.uk

- Study of sea level variations using GPS/tide gauges and crustal deformations

University of Hawai'i at Manoa - Department of Oceanography :

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- Study of sea level variations using GPS/tide gauges