ICG/PTWS Scientific meeting of experts, Arica, August. 20-08 2023

Meeting of Experts on Tsunami Sources and Hazard in Southern Peru and Northern Chile

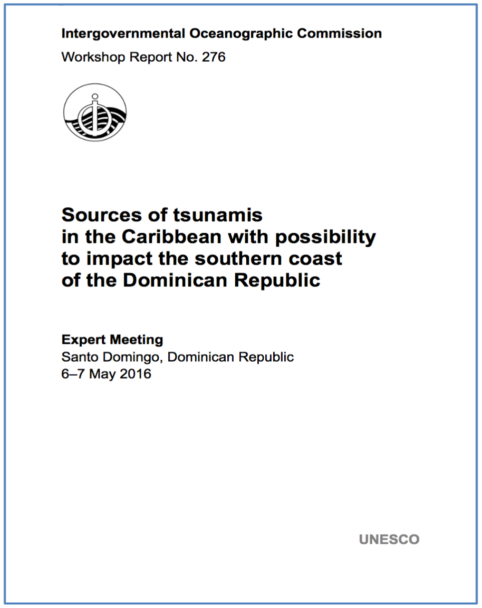
Diego Arcas
NOAA Center for Tsunami Research
Seattle, WA

Motivation for the Workshop

- IOC/PTWS Workshops Standardization and Guidance for Potential Tsunami Sources.
- Assessment of current tsunami warning and evacuation capabilities in the region.
- Evaluation of tsunami forecasting capabilities.
- Discussion on regional warning and research instrument networks.
- Open discussion on Seismic and Non-seismic Sources.
- Outcomes

UNESCO/IOC Workshop Series on Tsunami Sources

- **ICG/CEWS Sources of Tsunamis in the Caribbean with Possibility to Impact the Southern Coast of the Dominican Republic, expert meeting.** Santo Domingo, Dominican Republic, May 2016
- **ICG/PTWS Scientific meeting of experts to understand tsunami sources, hazards, risk and uncertainties associated with the Tonga-Kermadec Subduction Zone.** Wellington, New Zealand, October 2018
- **ICG/CEWS Experts Meeting on Sources of Tsunamis in the Lesser Antilles.** Fort-de-France, Martinique (France) March 2019.
- **ICG/PTWS Scientific meeting of experts to understand tsunami sources, hazards, risk and uncertainties associated with the Colombia-Ecuador Subduction Zone.** Guayaquil, Ecuador, Nov. 2020
- **ICG/PTWS Meeting of Experts on Tsunami Sources and Hazard in Southern Peru and Northern Chile.** Arica, Chile, August 2023.



Intergovernmental Oceanographic Commission

Workshop Report No. 276

Sources of tsunamis in the Caribbean with possibility to impact the southern coast of the Dominican Republic

Expert Meeting
Santo Domingo, Dominican Republic
6–7 May 2016

UNESCO

IOC Workshop Reports, 276 Rev. 2
page 2

During the first working session, a state of current knowledge was presented, whereas during the second part, experts discussed privately the most likely tsunami sources that might strike the Southern Coast of the Dominican Republic based on current knowledge.

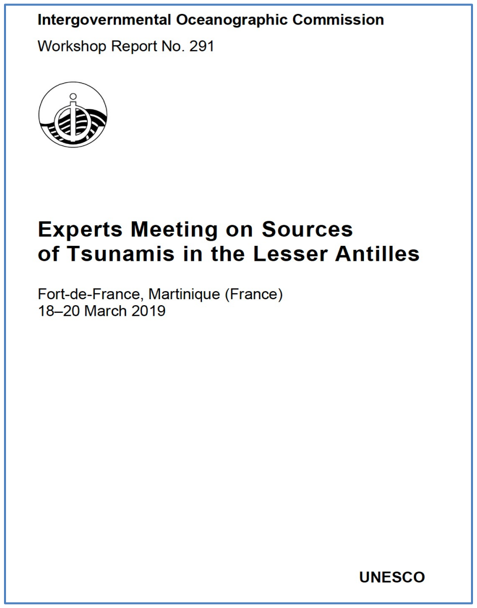
General session

The technical working session at the Library of the UASD started with the speaker Roger Acosta, former Director of the Seismological Institute of the Dominican Republic. Acosta synthesized the main thirteen earthquakes affecting the Dominican Republic from the first one in 1615 to the last one in 1984. Acosta said six of these caused casualties but just three caused tsunamis.

Figure 1.- Kick off meeting Group picture.

Figure 2.- Kick off meeting during the working session.

Followed Eric Calais, Professor at the École Normale Supérieure (France), who mainly talked about present-day tectonics with GPS comparative measurements between each tectonic plate and microplates in the Caribbean, showing basically how GPS velocities can be interpreted both where there is motion (compression/extension, strike-slip and transitional regimes) and where there are no registered movements (rigid behaviour).



Intergovernmental Oceanographic Commission

Workshop Report No. 291

Experts Meeting on Sources of Tsunamis in the Lesser Antilles

Fort-de-France, Martinique (France)
18–20 March 2019

UNESCO

IOC Workshop Reports, 291
Paris, September 2020
English only

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For bibliographic purposes this document should be cited as follows:

IOC-UNESCO. 2020. *Experts Meeting on Sources of Tsunamis in the Lesser Antilles. Fort-de-France, Martinique (France), 18–20 March 2019*. Paris, UNESCO. (Workshop Reports, 291).

Published in 2020
by the United Nations Educational,
Scientific and Cultural Organization
7, place de Fontenoy, 75352 Paris 07 SP

(IOC/2020/WR/291)

Tsunami Evacuation Map

WHAT IS A TSUNAMI?

A tsunami is a series of waves most commonly caused by an earthquake beneath the sea floor. As tsunamis Enter shallow water near land, they increase in height and can cause great loss of life and property damage where they come ashore. Recent research suggests that tsunamis have struck the Washington coast on a regular basis. They can occur at any time of the day or night, under any and all weather conditions, and in all seasons. Beaches open to the ocean, bay entrances, tidal flats, and coastal rivers are especially vulnerable to tsunamis.

WHAT IS THE DIFFERENCE BETWEEN A 'DISTANT' AND A 'LOCAL' TSUNAMI?

When a tsunami has been generated by a distant earthquake, it will not reach the Washington coast for several hours, and there is time to issue a warning. When a tsunami is generated by a strong earthquake in the Puget Sound area , its first waves would reach the inland shorelines minutes after the ground stops shaking. Feeling an earthquake could be your only warning!

WHAT CAN I DO TO PROTECT MYSELF FROM A TSUNAMI?

>Develop a family disaster plan. Everyone needs to know what to do on their own to protect themselves in case of disaster.

>Be familiar with local earthquake and tsunami plans.

Know where to go to survive a tsunami. Identify an evacuation site within 15 minutes walking distance of home and/or work.

HOW DO I KNOW WHEN TO EVACUATE?

If you feel the ground shake, evacuate Inland to high ground immediately! A wave as high as 30 feet could reach the Port of Tacoma area within 10-15 minutes of the quake. The first wave is often not the largest; successive waves may be spaced many minutes apart and continue to arrive for several hours. Return only after emergency officials say it is safe.

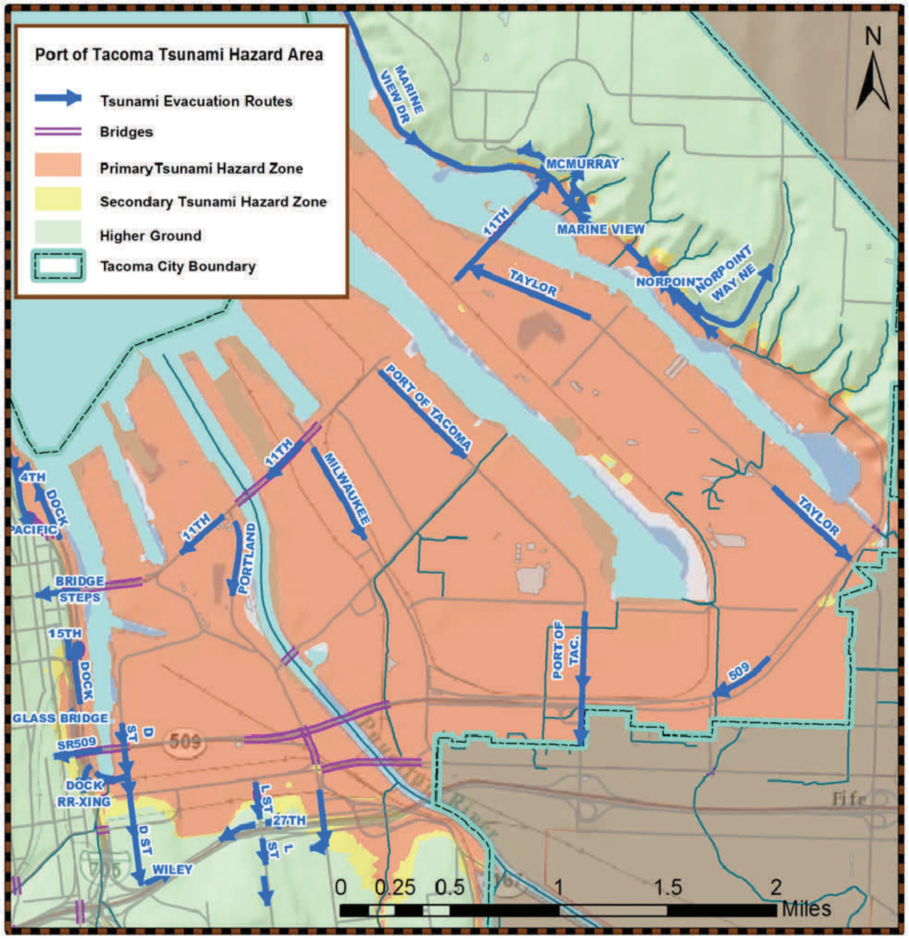
WHERE DO I EVACUATE TO?

The map shows primary tsunami hazard zone (salmon), secondary tsunami hazard zones (yellow) and areas of higher ground (light green) and arrows (blue) for suggested evacuation routes to high ground.

Go to the nearest high ground—at least 30 feet above sea level, if possible 50 feet. If you don't have time to travel to high ground, but are in a multi-story building, go to an upper level.

WHAT DO THE EVACUATION SIGNS MEAN?

Tsunami evacuation routes were developed to guide residents and visitors to safer locations when evacuation is possible. Evacuation signs along the main roads direct pedestrians and motorists to higher ground. In some places, there may be more than one way to reach safer areas. These routes are marked with multiple signs showing additional options for evacuation. In some instances walking/running will be

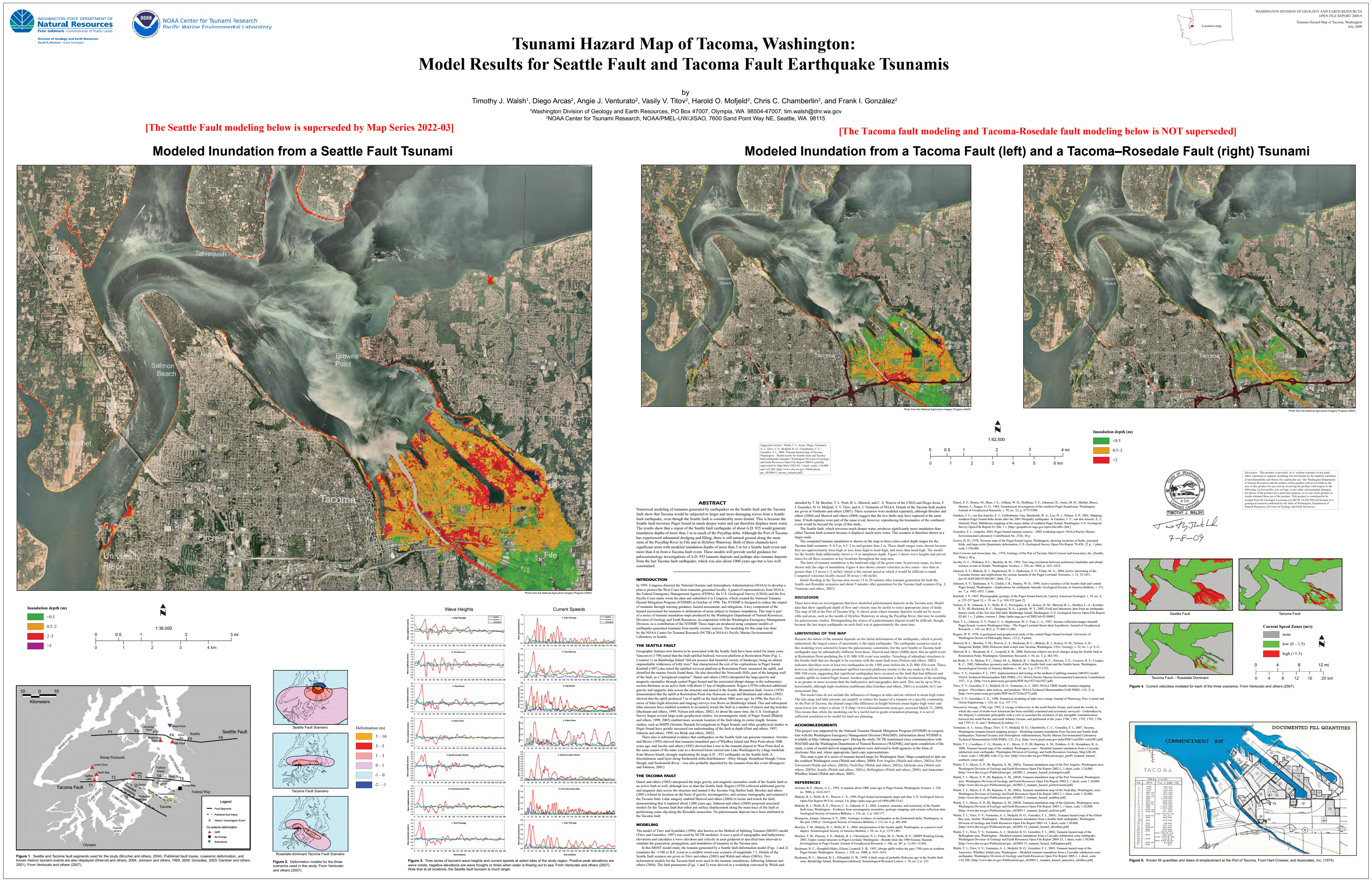


HOW DO I GET INLAND OR TO HIGH GROUND?

Car evacuation may not be possible if an earthquake has damaged roads and power lines and resulted in significant debris. If this is the case, evacuate on foot directly to the nearest high ground. Avoid lakes and wetlands, which are prone to flooding

Tsunami Hazard Map

(Inundation Map)



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NOAA Center for Tsunami Research
Pacific Marine Environmental Laboratory

WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES
OPEN FILE REPORT 2009-9
Tsunami Hazard Map of Tacoma, Washington
July 2009

Tsunami Hazard Map of Tacoma, Washington:
Model Results for Seattle Fault and Tacoma Fault Earthquake Tsunamis

by
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[The Seattle Fault modeling below is superseded by Map Series 2022-03]

Modeled Inundation from a Seattle Fault Tsunami

[The Tacoma fault modeling and Tacoma-Rosedale fault modeling below is NOT superseded]

Modeled Inundation from a Tacoma Fault (left) and a Tacoma–Rosedale Fault (right) Tsunami

Suggested citation: Walsh, T. J.; Arcas, Diego; Venturato, A. J.; Titov, V. V.; Mofjeld, H. O.; Chamberlin, C. C.; González, F. I., 2009, Tsunami hazard map of Tacoma, Washington—Model results for Seattle fault and Tacoma fault earthquake tsunamis: Washington Division of Geology and Earth Resources Open File Report 2009-9, partially superseded by Map Sheet 2022-03, 1 sheet, scales 1:36,000 and 1:62,500. [http://www.dnr.wa.gov/ Publications/ ger_ofr2009-9_tacoma_tsunami.pdf]

ABSTRACT

Numerical modeling of tsunamis generated by earthquakes on the Seattle fault and the Tacoma fault show that Tacoma would be subjected to larger and more damaging waves from a Seattle fault earthquake, even though the Seattle fault is considerably more distant. This is because the Seattle fault traverses Puget Sound in much deeper water and can therefore displace more water. The results show that a repeat of the Seattle fault earthquake of about A.D. 935 would generate inundation depths of more than 2 m in much of the Puyallup delta. Although the Port of Tacoma has experienced substantial dredging and filling, there is still natural ground along the main stem of the Puyallup River in Fife and in Hylebos Waterway. Both of these channels have significant areas with modeled inundation depths of more than 5 m for a Seattle fault event and more than 4 m from a Tacoma fault event. These models will provide useful guidance for paleoseismology investigations of A.D. 935 tsunami deposits and perhaps also tsunami deposits from the last Tacoma fault earthquake, which was also about 1000 years ago but is less well constrained.

INTRODUCTION

In 1995, Congress directed the National Oceanic and Atmospheric Administration (NOAA) to develop a plan to protect the West Coast from tsunamis generated locally. A panel of representatives from NOAA, the Federal Emergency Management Agency (FEMA), the U.S. Geological Survey (USGS) and the five Pacific Coast states wrote the plan and submitted it to Congress, which created the National Tsunami Hazard Mitigation Program (NTHMP) in October of 1996. The NTHMP is designed to reduce the impact of tsunamis through warning guidance, hazard assessment, and mitigation. A key component of the hazard assessment for tsunamis is delineation of areas subject to tsunami inundation. This map is part of a series of tsunami inundation maps produced by the Washington Department of Natural Resources, Division of Geology and Earth Resources, in cooperation with the Washington Emergency Management Division, as a contribution of the NTHMP. These maps are produced using computer models of earthquake-generated tsunamis from nearby seismic sources. The modeling for this map was done by the NOAA Center for Tsunami Research (NCTR) at NOAA's Pacific Marine Environmental Laboratory in Seattle.

THE SEATTLE FAULT

Geographic features now known to be associated with the Seattle fault have been noted for many years. Vancouver (1798) noted that the fault-uplifted bedrock wavecut platform at Restoration Point (Fig. 1, Location 1) on Bainbridge Island "did not possess that beautiful variety of landscape, being an almost impenetrable wilderness of lofty trees" that characterized the rest of his explorations in Puget Sound. Kimball (1897) also noted the uplifted wavecut platform at Restoration Point, measured the uplift, and identified the marine fossils found there. He also described the Newcastle Hills, part of the hanging wall of the fault, as a "postglacial eruption". Daneš and others (1965) interpreted the large gravity and magnetic anomalies through central Puget Sound and the associated abrupt change in the sedimentary section thickness as an active fault with about 11 km of displacement. Rogers (1970) collected additional gravity and magnetic data across the structure and named it the Seattle–Bremerton fault. Gower (1978) demonstrated that the uplift at Restoration Point was Holocene in age and Bucknam and others (1992) showed that the uplift produced 7 m of uplift on the fault about 1000 years ago. In 1996, the first of a series of lidar (light detection and ranging) surveys was flown on Bainbridge Island. This and subsequent lidar missions have enabled scientists to accurately locate the fault in a number of places and dig trenches (Bucknam and others, 1999; Nelson and others, 2002). At about the same time, the U.S. Geological Survey began several large-scale geophysical studies. An aeromagnetic study of Puget Sound (Blakely and others, 1999, 2002) enabled more accurate location of the fault along its entire length. Seismic studies, such as SHIPS (Seismic Hazards Investigations in Puget Sound), and other geophysical studies in Puget Sound have greatly increased our understanding of the fault at depth (Pratt and others, 1997; Johnson and others, 1999; ten Brink and others, 2002).

There also is substantial evidence that earthquakes on the Seattle fault can generate tsunamis. Atwater and Moore (1992) showed that tsunamis inundated part of Whidbey Island and West Point about 1000 years ago, and Jacoby and others (1992) showed that a tree in the tsunami deposit at West Point died in the same season of the same year as a drowned forest carried into Lake Washington by a huge landslide from Mercer Island, strongly implicating the large A.D. ~935 earthquake on the Seattle fault. A discontinuous sand layer along Snohomish delta distributaries—Ebey Slough, Steamboat Slough, Union Slough, and Snohomish River—was also probably deposited by the tsunami from this event (Bourgeois and Johnson, 2001).

THE TACOMA FAULT

Daneš and others (1965) interpreted the large gravity and magnetic anomalies south of the Seattle fault as an active fault as well, although less so than the Seattle fault. Rogers (1970) collected additional gravity and magnetic data across the structure and named it the Tacoma–Gig Harbor fault. Brocher and others (2001) refined its location on the basis of gravity, aeromagnetics, and seismic tomography and renamed it the Tacoma fault. Lidar imagery enabled Sherrod and others (2004) to locate and trench the fault, demonstrating that it ruptured about 1,000 years ago. Johnson and others (2004) proposed structural models for the Tacoma fault that either put surface displacement along the main trace of the fault or partitioning some slip along the Rosedale monocline. No paleotsunami deposits have been attributed to the Tacoma fault.

MODELING

The model of Titov and Synolakis (1998), also known as the Method of Splitting Tsunami (MOST) model (Titov and González, 1997) was used by NCTR modelers. It uses a grid of topographic and bathymetric elevations and calculates a wave elevation and velocity at each gridpoint at specified time intervals to simulate the generation, propagation, and inundation of tsunamis in the Tacoma area.

In this MOST model study, the tsunami generated by a Seattle fault deformation model (Figs. 1 and 2) simulates the ~1100 yr B.P. event as a credible worst-case scenario of magnitude 7.3. Details of the Seattle fault scenario are given in Titov and others (2003) and Walsh and others (2003c). Two deformation models for the Tacoma fault were used in the tsunami simulations, following Johnson and others (2004). The fault parameters (Figs. 1 and 2) were derived in a workshop convened by Walsh and attended by T. M. Brocher, T. L. Pratt, B. L. Sherrod, and C. S. Weaver of the USGS and Diego Arcas, F. I. González, H. O. Mofjeld, V. V. Titov, and A. J. Venturato of NOAA. Details of the Tacoma fault models are given in Venturato and others (2007). These scenarios were modeled separately, although Brocher and others (2004) and Sherrod and others (2004) suggest that the two faults may have ruptured at the same time. If both ruptures were part of the same event, however, reproducing the kinematics of the combined event would be beyond the scope of this study.

The Seattle fault, which traverses much deeper water, produces significantly more inundation than either Tacoma fault scenario because it displaces much more water. This scenario is therefore shown at a larger scale.

The computed tsunami inundation is shown on the map in three color-coded depth ranges for the Tacoma fault scenarios: 0–0.5 m, 0.5–2 m, and greater than 2 m. These depth ranges were chosen because they are approximately knee-high or less, knee-high to head-high, and more than head-high. The model for the Seattle fault additionally shows a >5 m inundation depth. Figure 3 shows wave heights and arrival times for all three scenarios at key locations throughout the map area.

The limit of tsunami inundation is the landward edge of the green zone. In previous maps, we have shown only the edge of inundation. Figure 4 also shows current velocities in two zones—less than or greater than 1.5 m/sec (~3 mi/hr), which is the current speed at which it would be difficult to stand. Computed velocities locally exceed 30 m/sec (~60 mi/hr).

Initial flooding in the Tacoma area occurs 15 to 20 minutes after tsunami generation for both the Seattle and Rosedale scenarios and about 5 minutes after generation for the Tacoma fault scenario (Fig. 3; Venturato and others, 2007).

DISCUSSION

There have been no investigations that have identified paleotsunami deposits in the Tacoma area. Model data that show significant depth of flow and velocity may be useful to select appropriate areas of study. The map of fill at the Port of Tacoma (Fig. 5) shows areas where tsunami deposits would not be accessible and areas, such as the mouth of Hylebos Waterway or along the Puyallup River, that may be suitable for paleoseismic studies. Distinguishing the source of a paleotsunami deposit would be difficult, though, because the last major earthquake on each fault was at approximately the same time.

LIMITATIONS OF THE MAP

Because the nature of the tsunami depends on the initial deformation of the earthquake, which is poorly understood, the largest source of uncertainty is the input earthquake. The earthquake scenarios used in this modeling were selected to honor the paleoseismic constraints, but the next Seattle or Tacoma fault earthquake may be substantially different from these. Sherrod and others (2000) show that an uplift event at Restoration Point predating the A.D. 900–930 event was smaller. Trenching of subsidiary structures to the Seattle fault that are thought to be coseimic with the main fault trace (Nelson and others, 2002) indicates that there were at least two earthquakes in the 1500 years before the A.D. 900–930 event. These, however, did not produce prominent uplifted wavecut platforms similar to the one made by the A.D. 900–930 event, suggesting that significant earthquakes have occurred on the fault that had different and smaller uplifts in central Puget Sound. Another significant limitation is that the resolution of the modeling is no greater or more accurate than the bathymetric and topographic data used. This can be up to 50 m horizontally, although high-resolution multibeam data (Gardner and others, 2001) is available for Commencement Bay.

The model runs do not include the influences of changes in tides and are referred to mean high water. The tide stage and tidal currents can amplify or reduce the impact of a tsunami on a specific community. At the Port of Tacoma, the diurnal range (the difference in height between mean higher high water and mean lower low water) is about 12 ft (http://www.tidesandcurrents.noaa.gov, accessed March 23, 2009). This means that, while the modeling can be a useful tool to guide evacuation planning, it is not of sufficient resolution to be useful for land-use planning.

ACKNOWLEDGMENTS

This project was supported by the National Tsunami Hazards Mitigation Program (NTHMP) in cooperation with the Washington Emergency Management Division (WAEMD). Information about NTHMP is available at http://nthmp.tsunami.gov/. During the study, NCTR maintained close communication with WAEMD and the Washington Department of Natural Resources (WADNR), and upon completion of the study, a suite of model-derived mapping products were delivered to both agencies in the form of electronic files and, where appropriate, hard-copy representations.

This map is part of a series of tsunami hazard maps for Washington State. Maps completed to date are the southern Washington coast (Walsh and others, 2000), Port Angeles (Walsh and others, 2002a), Port Townsend (Walsh and others, 2002b), Neah Bay (Walsh and others, 2003a), Quileute area (Walsh and others, 2003b), Seattle (Walsh and others, 2003c), Bellingham (Walsh and others, 2004), and Anacortes–Whidbey Island (Walsh and others, 2005).

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TIMOTHY J. WALSH
Engineering Geologist
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Figure 1. Seattle and Tacoma fault segments used for the study (Brocher and others, 2004). Published fault traces, coseismic deformation, and known historic tsunami events are also displayed (Sherrod and others, 2004; Johnson and others, 1999, 2004; González, 2003; Gardner and others, 2001). From Venturato and others (2007).

Seattle Fault Scenario

Tacoma Fault Scenario

Rosedale-dominant Tacoma Fault Scenario

Figure 2. Deformation models for the three scenarios used in this study. From Venturato and others (2007).

Figure 3. Time series of tsunami wave heights and current speeds at select sites of the study region. Positive peak elevations are wave crests; negative elevations are wave troughs or times when water is flowing out to sea. From Venturato and others (2007). Note that at all locations, the Seattle fault tsunami is much larger.

Seattle Fault

Tacoma Fault

Tacoma Fault – Rosedale Dominant

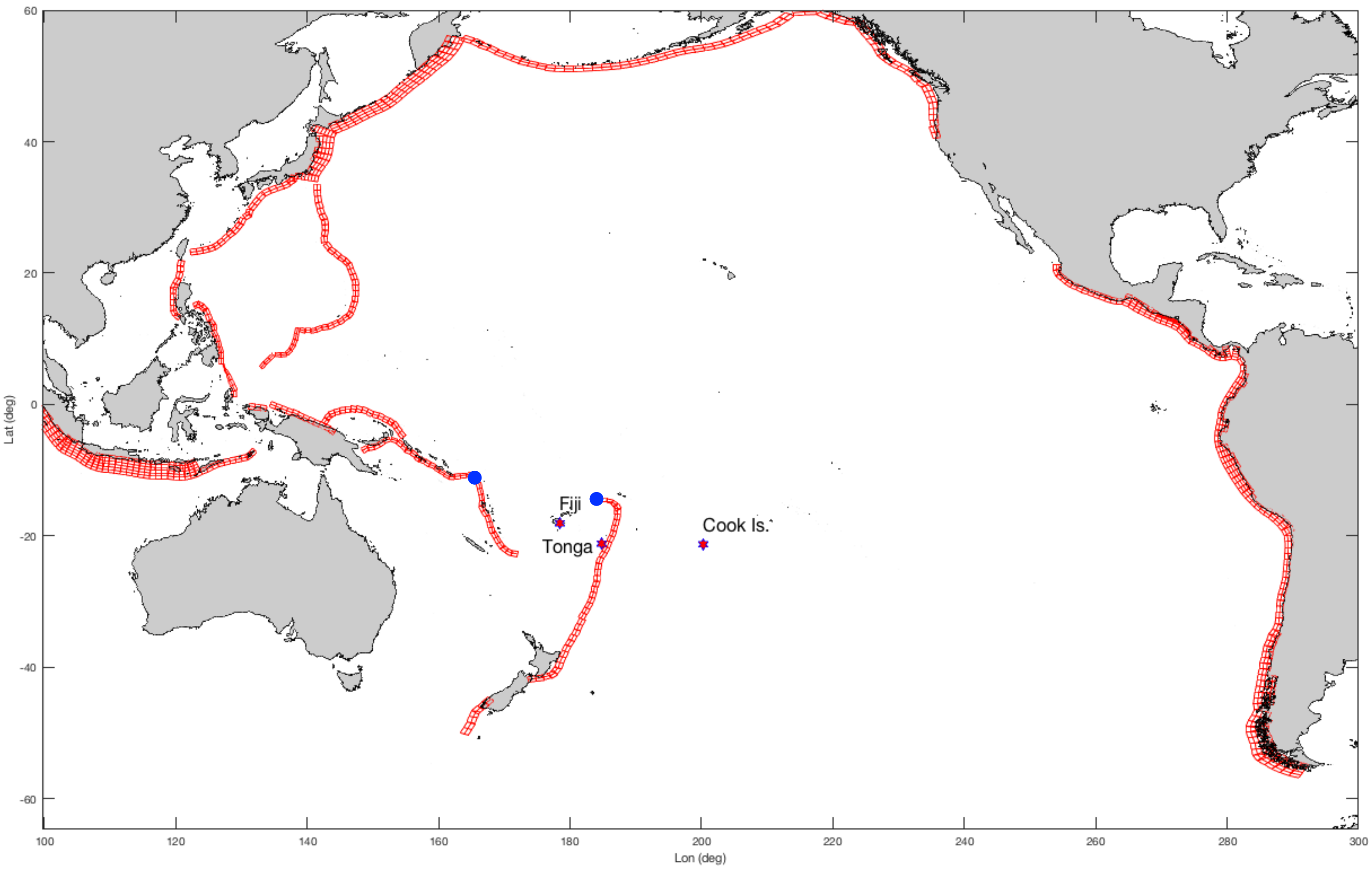
Figure 4. Current velocities modeled for each of the three scenarios. From Venturato and others (2007).

Figure 5. Known fill quantities and dates of emplacement at the Port of Tacoma. From Hart-Crowser, and Associates, Inc. (1974).

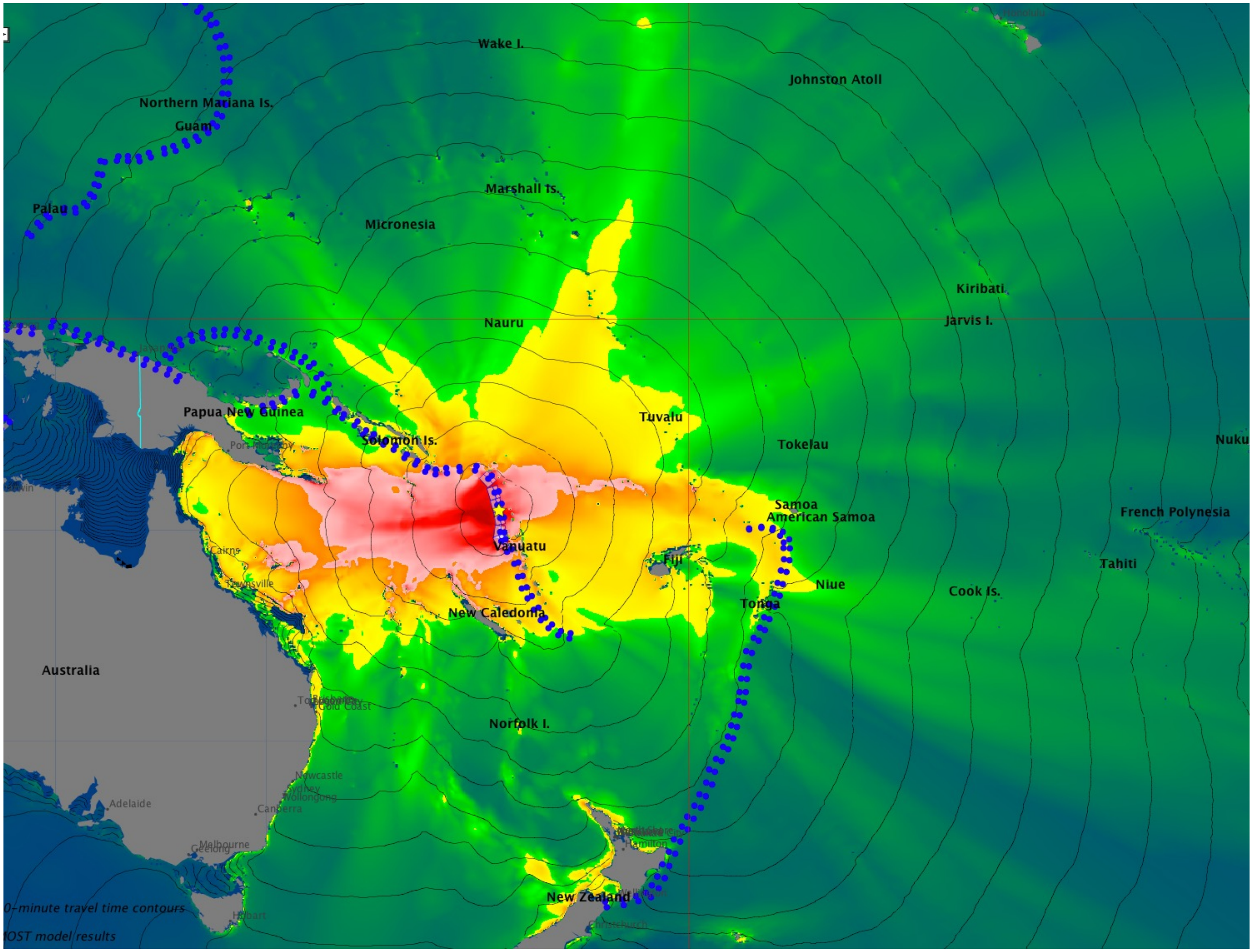
http://www.dnr.wa.gov/AboutDNR/Divisions/GER/

NCTR Tsunami Hazard Assessment Methodology

NCTR Precomputed Sources



Tsunami Energy- Directivity (New Hebrides Subduction Zone)



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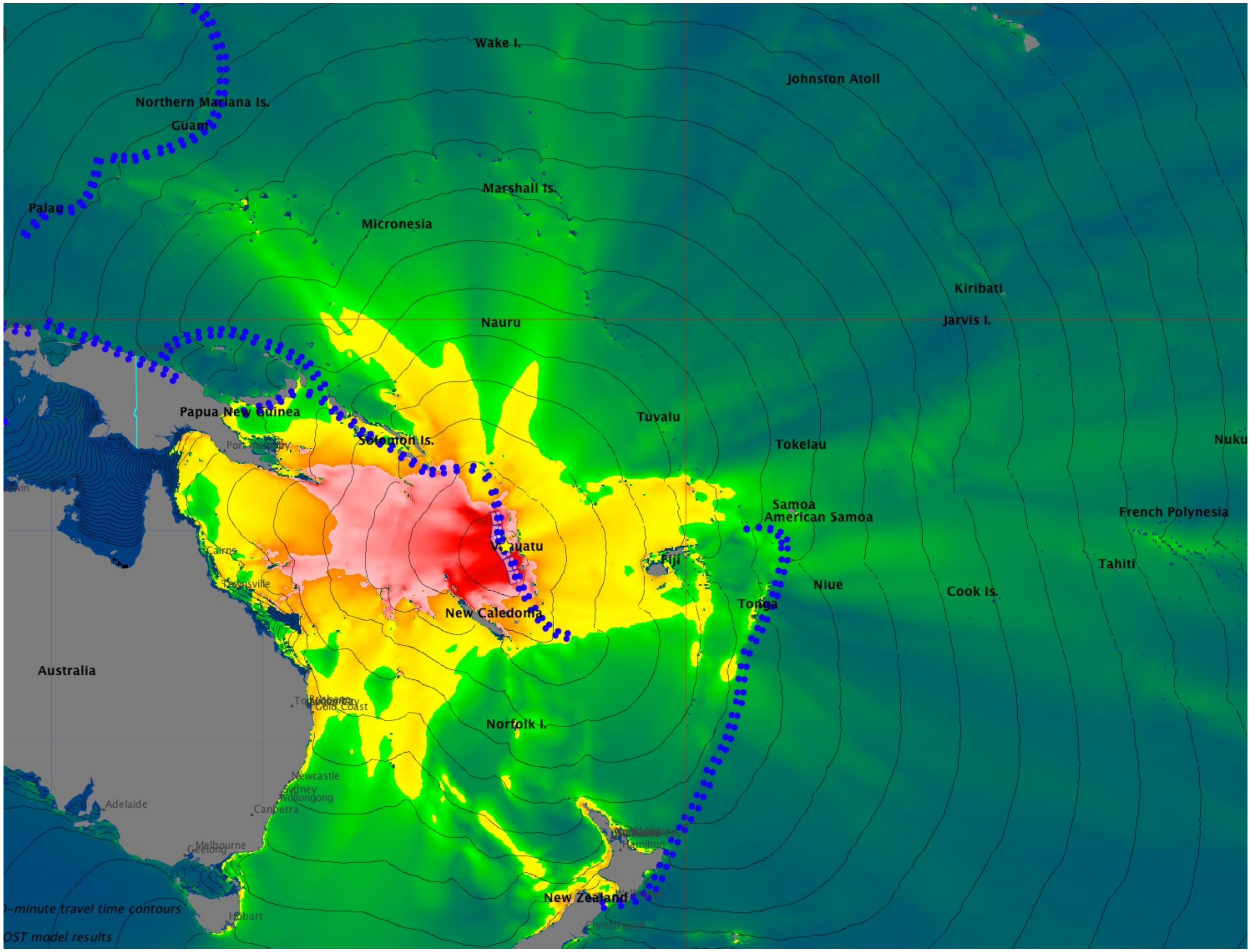

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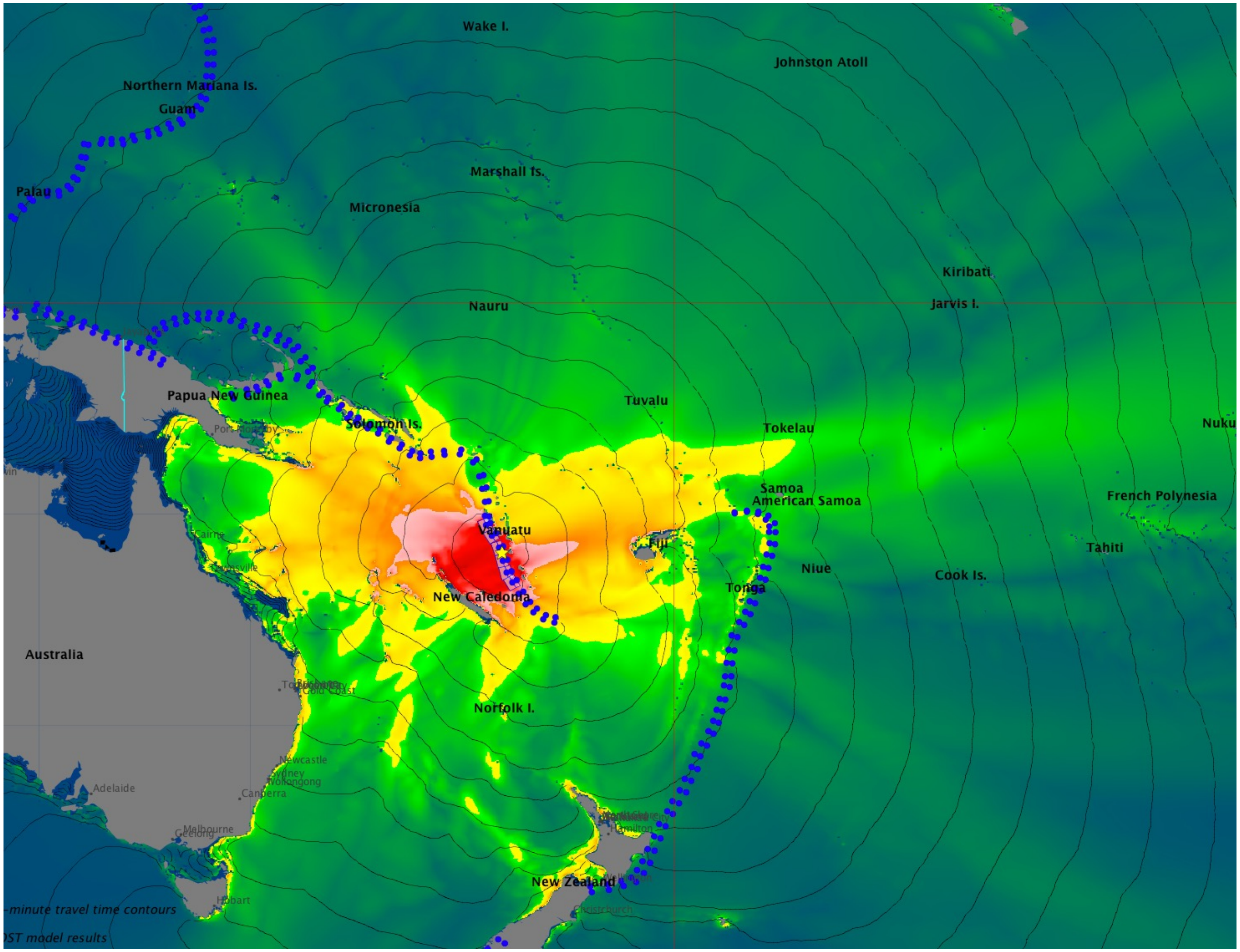

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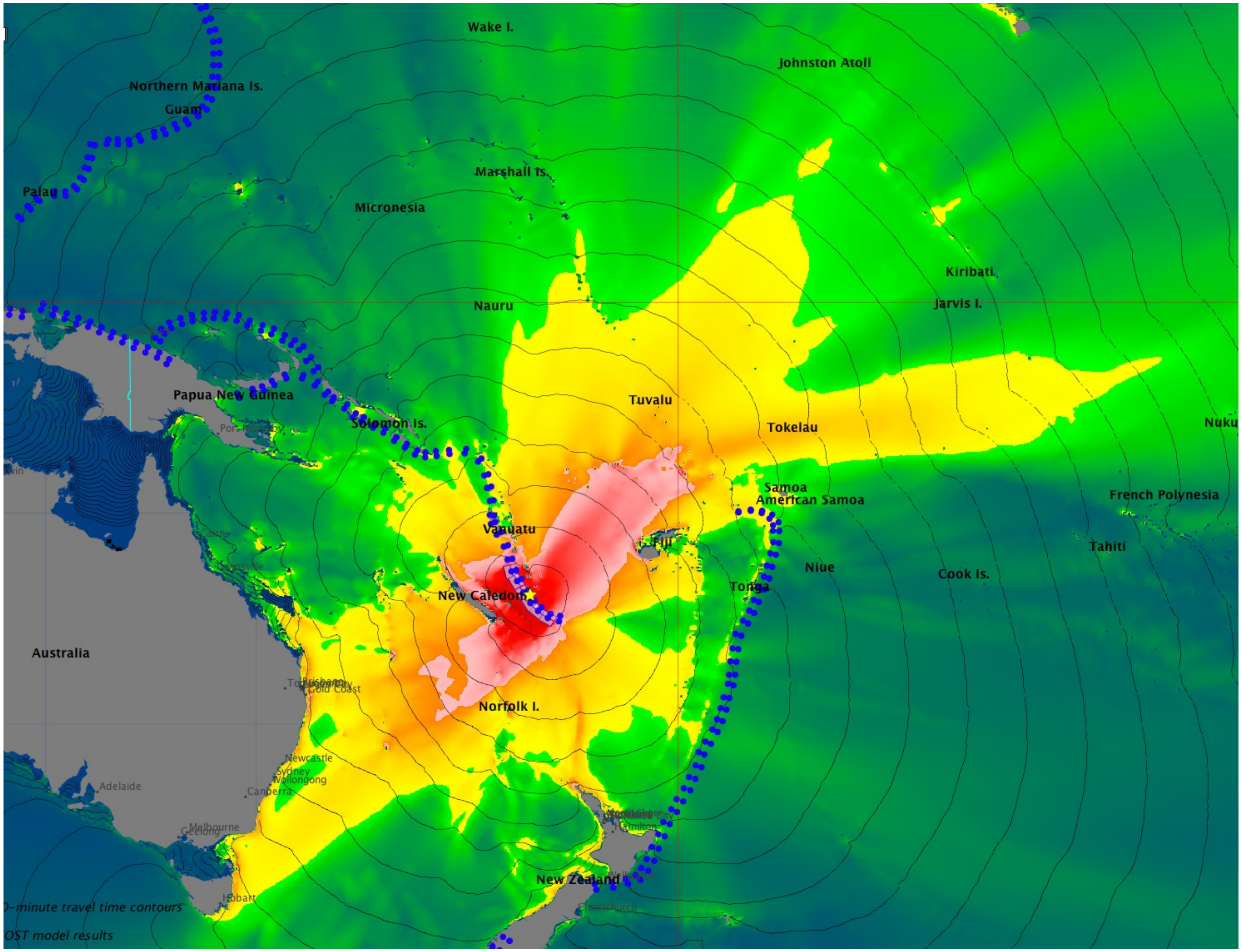
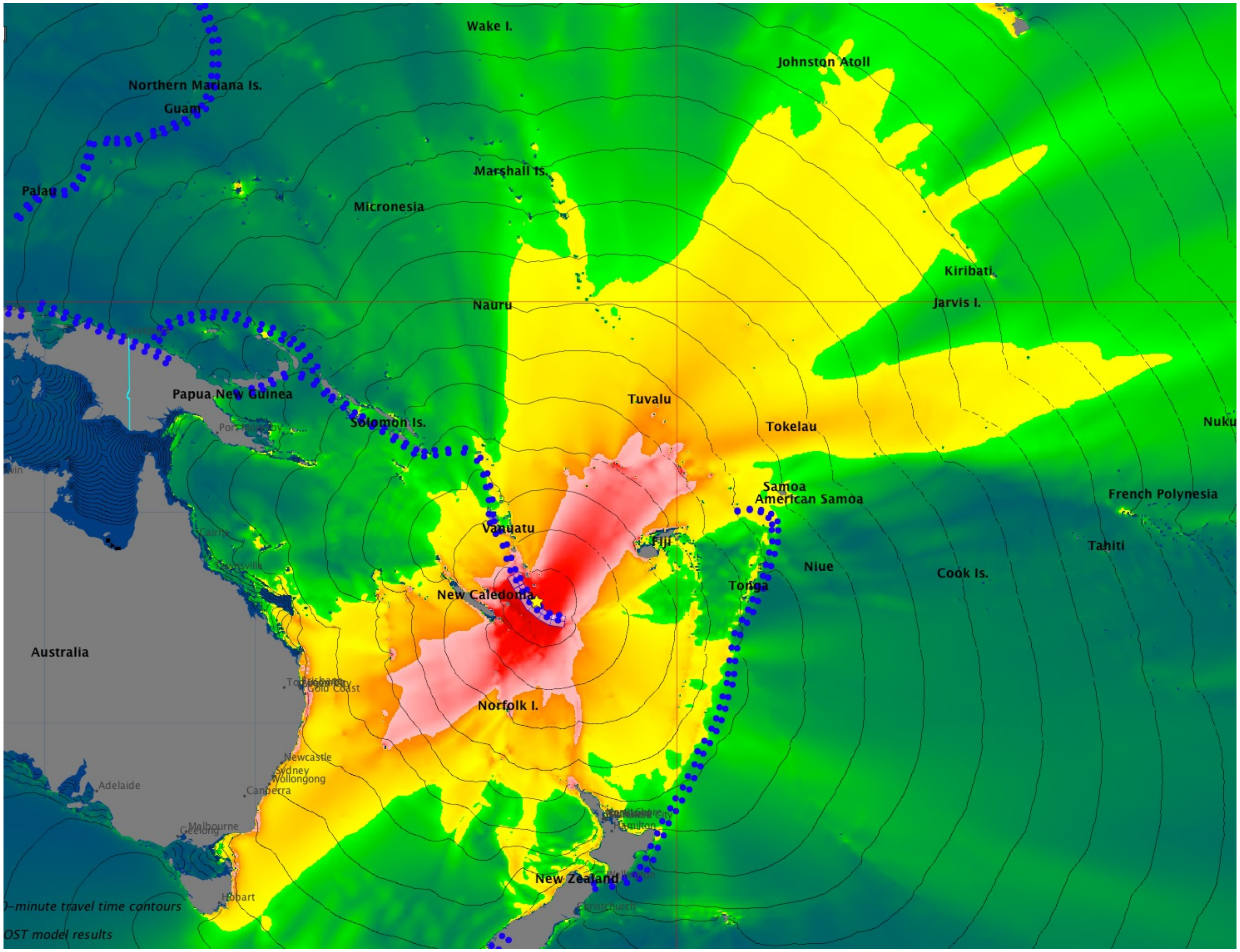


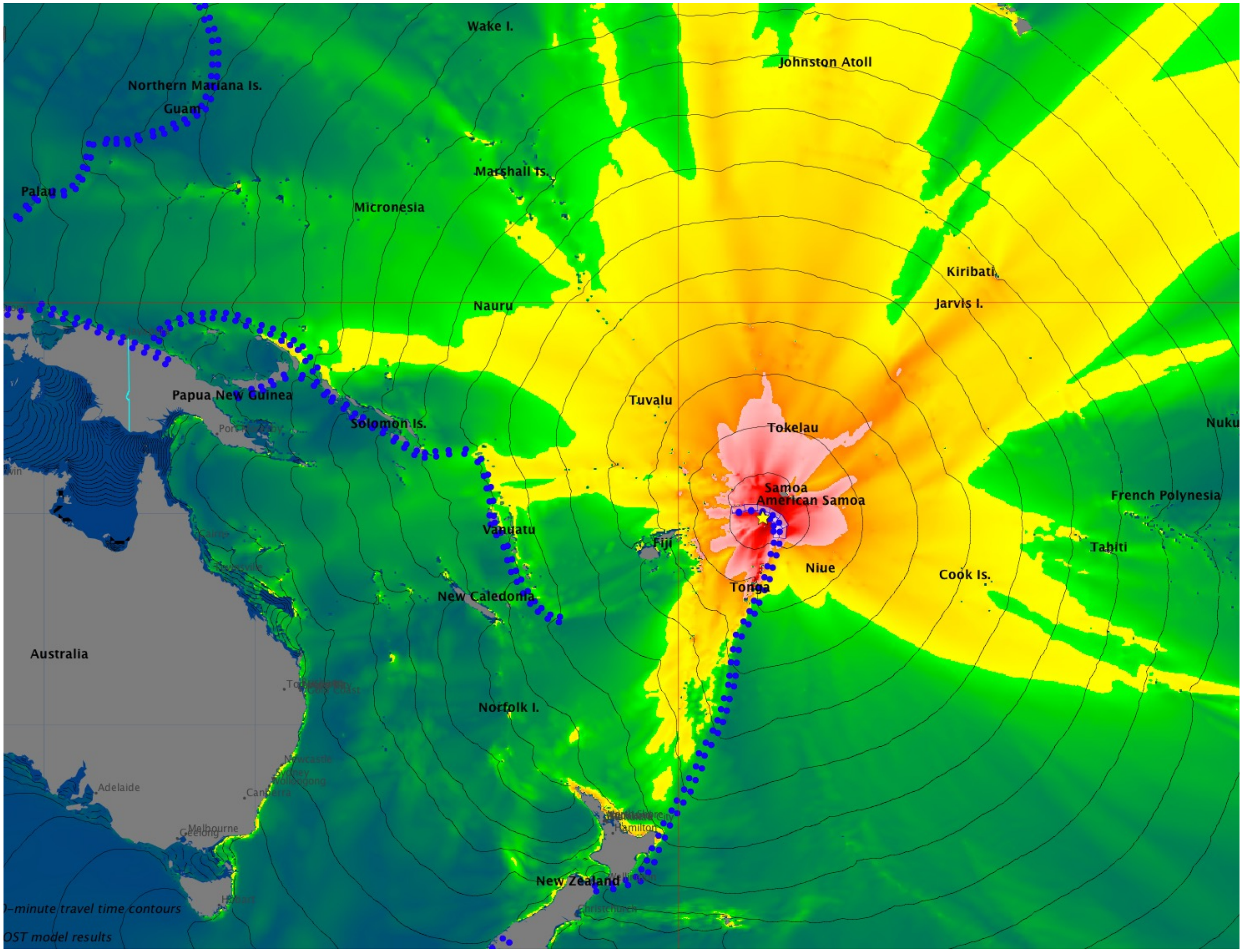
0-minute travel time contours

OST model results

Tsunami Energy- Directivity (New Hebrides Subduction Zone)

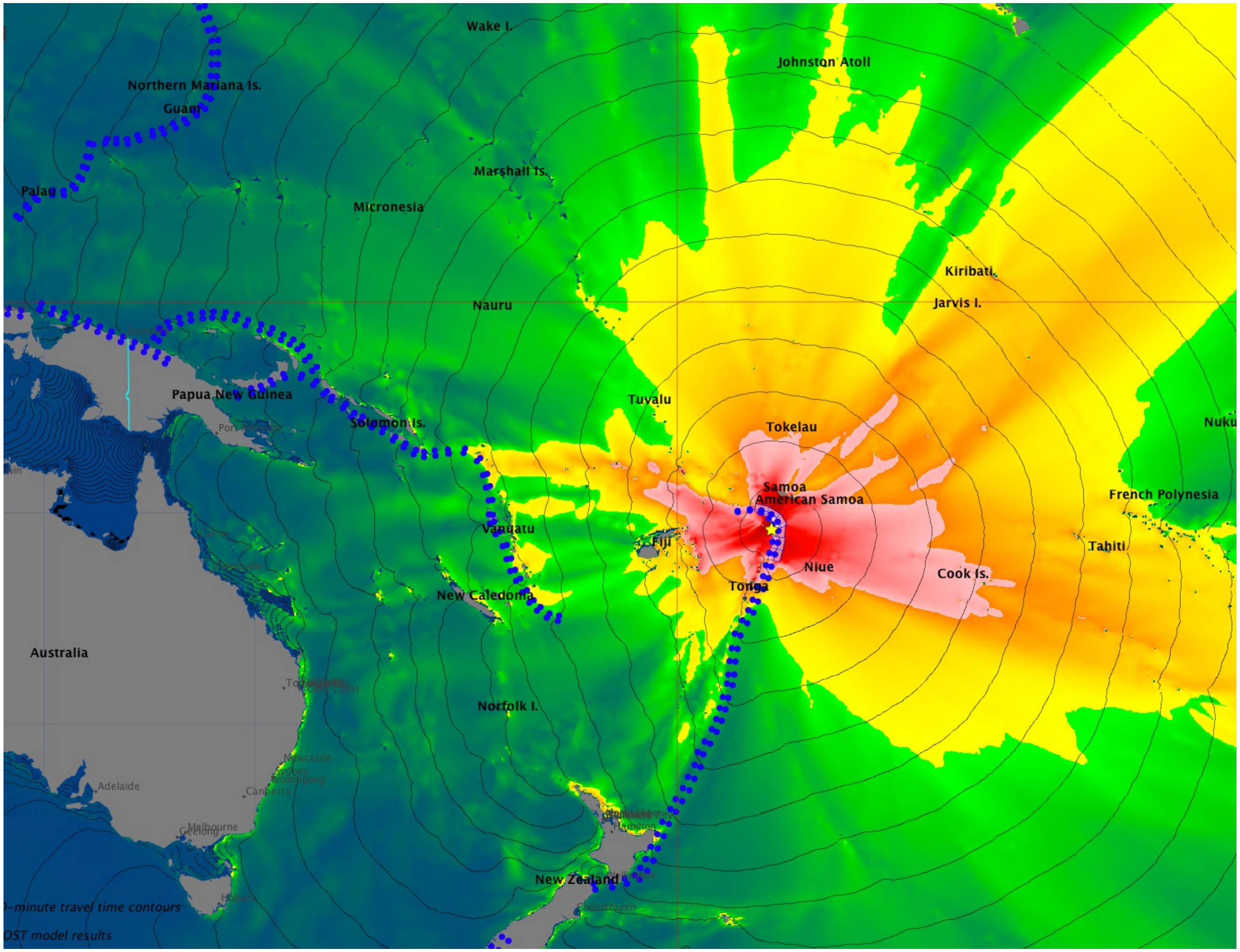


Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)

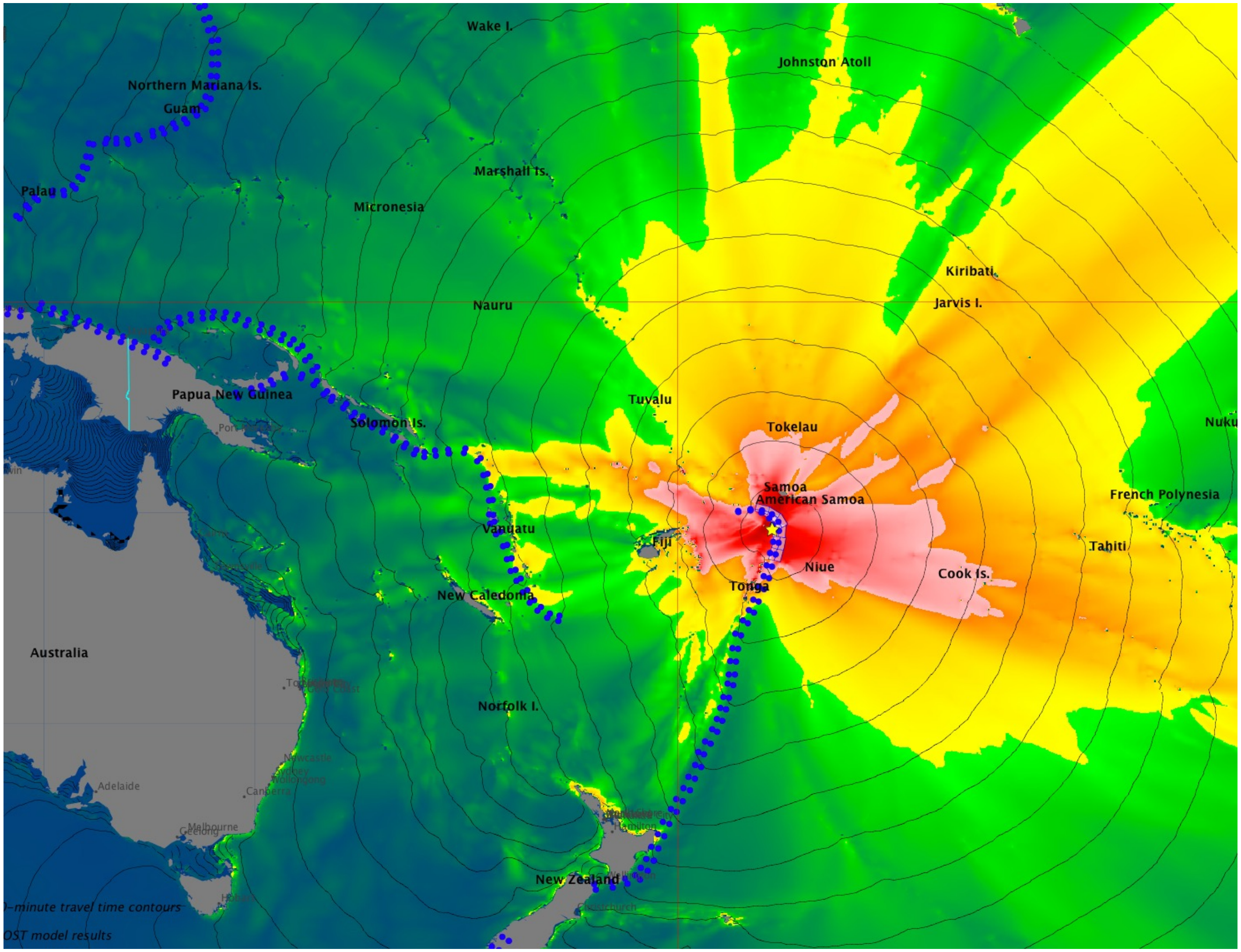


-minute travel time contours
OST model results

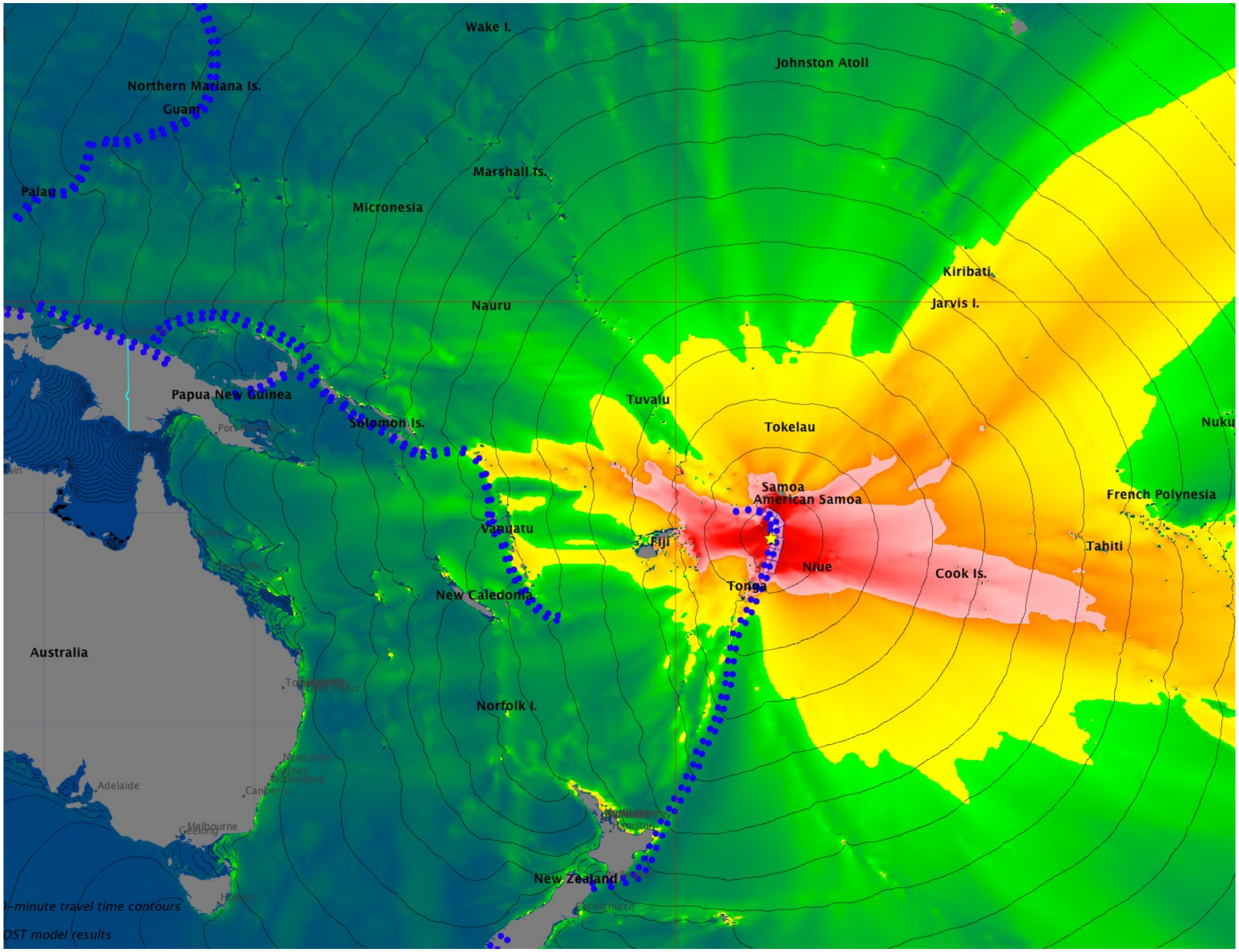
Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)



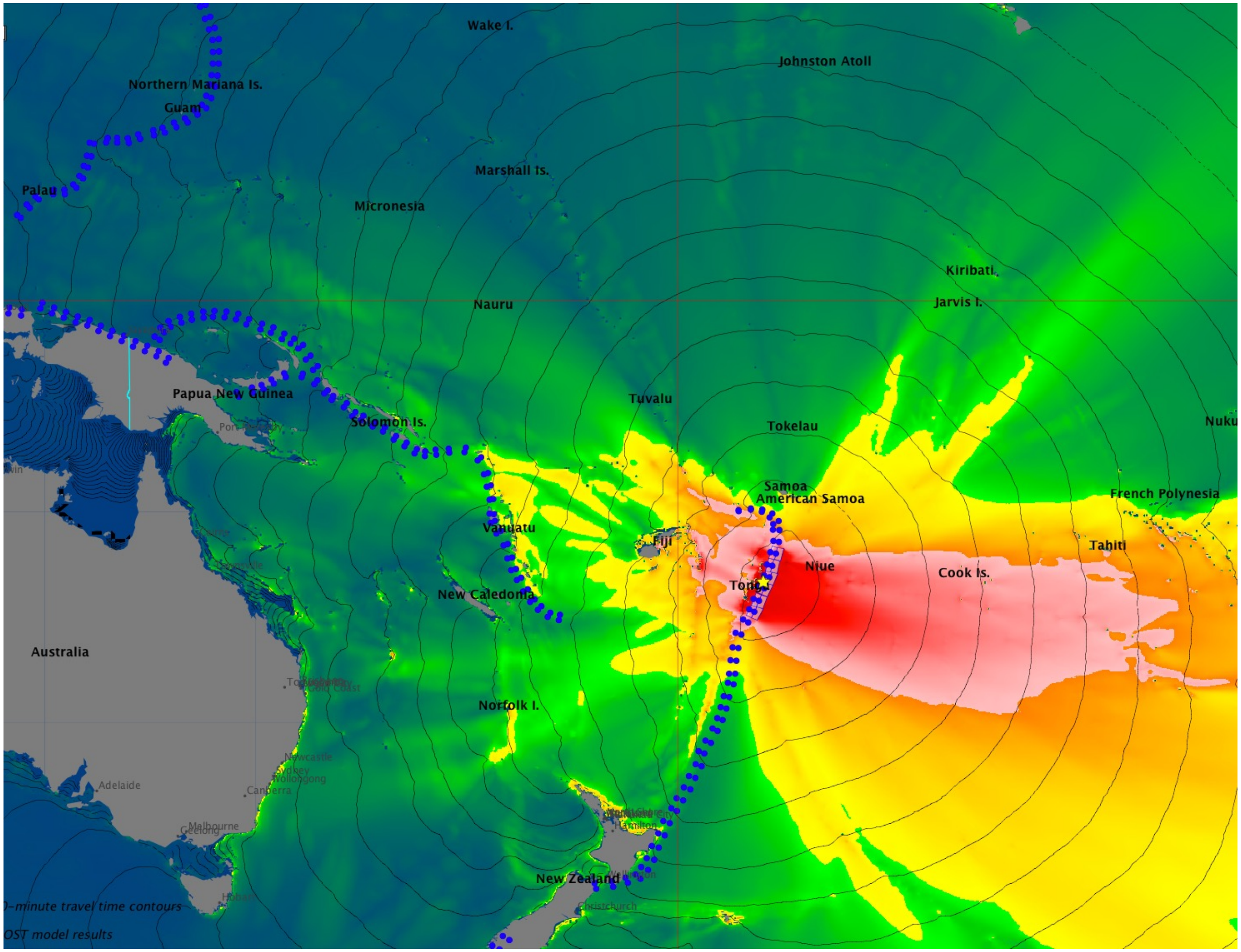
Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)



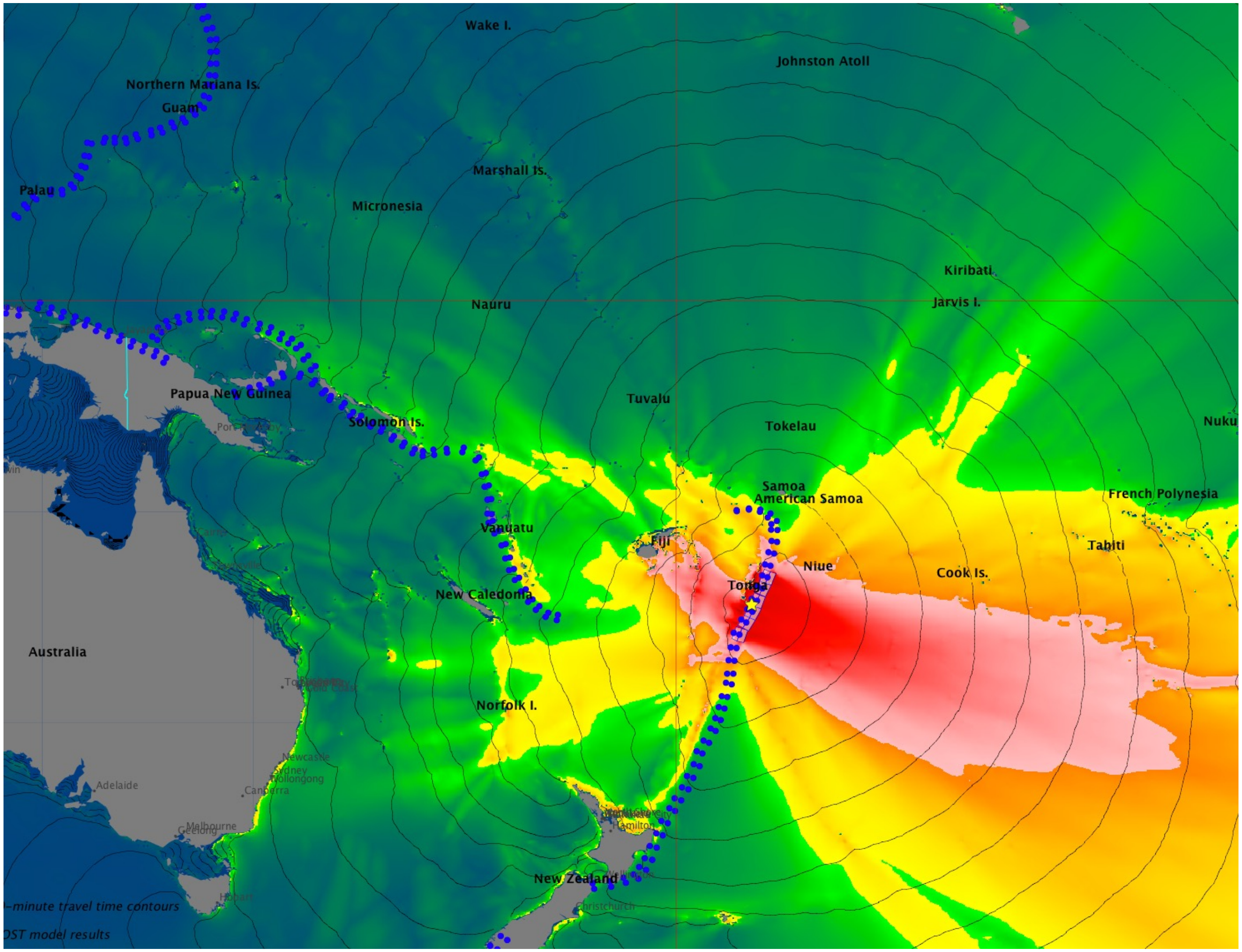
Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)



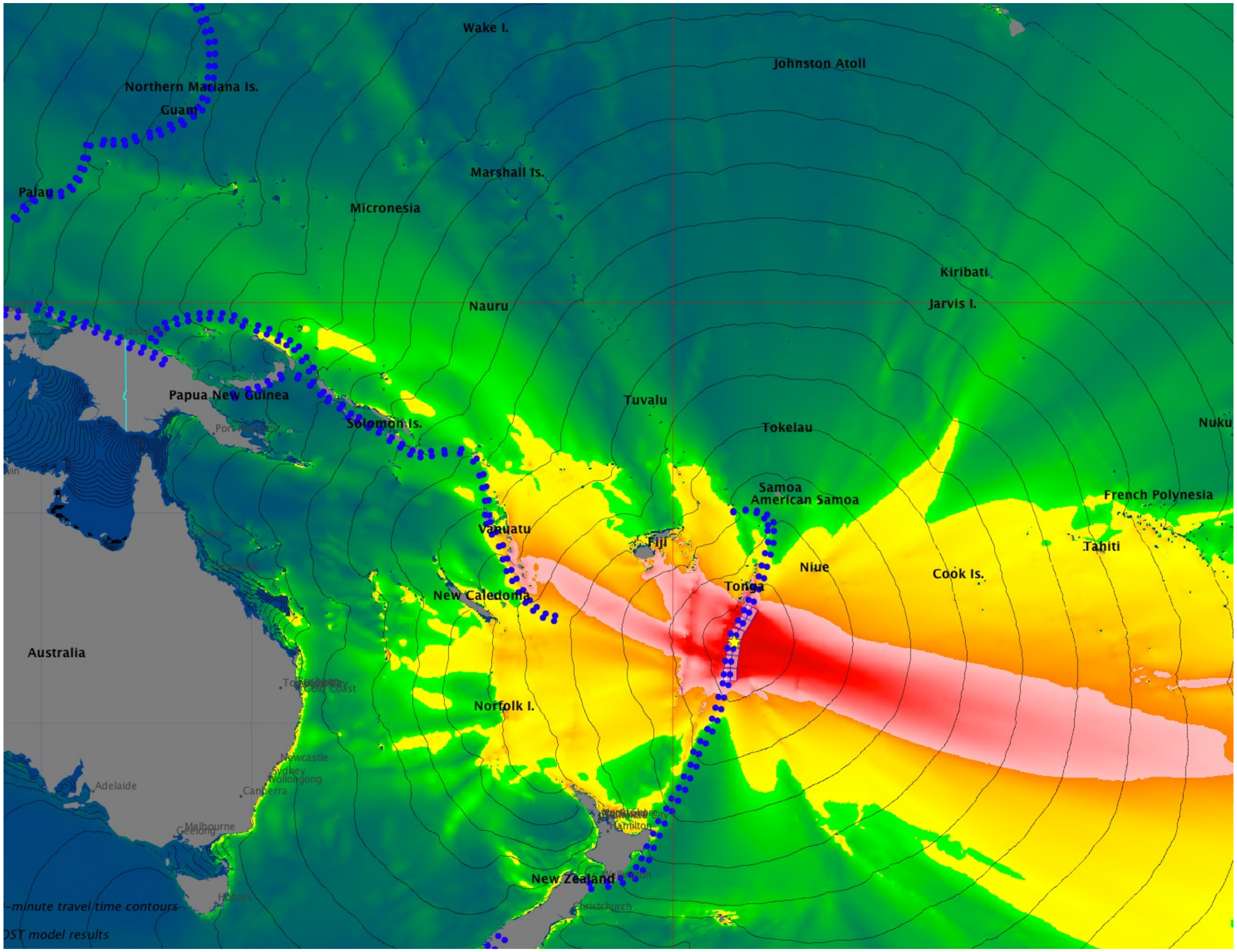
Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)

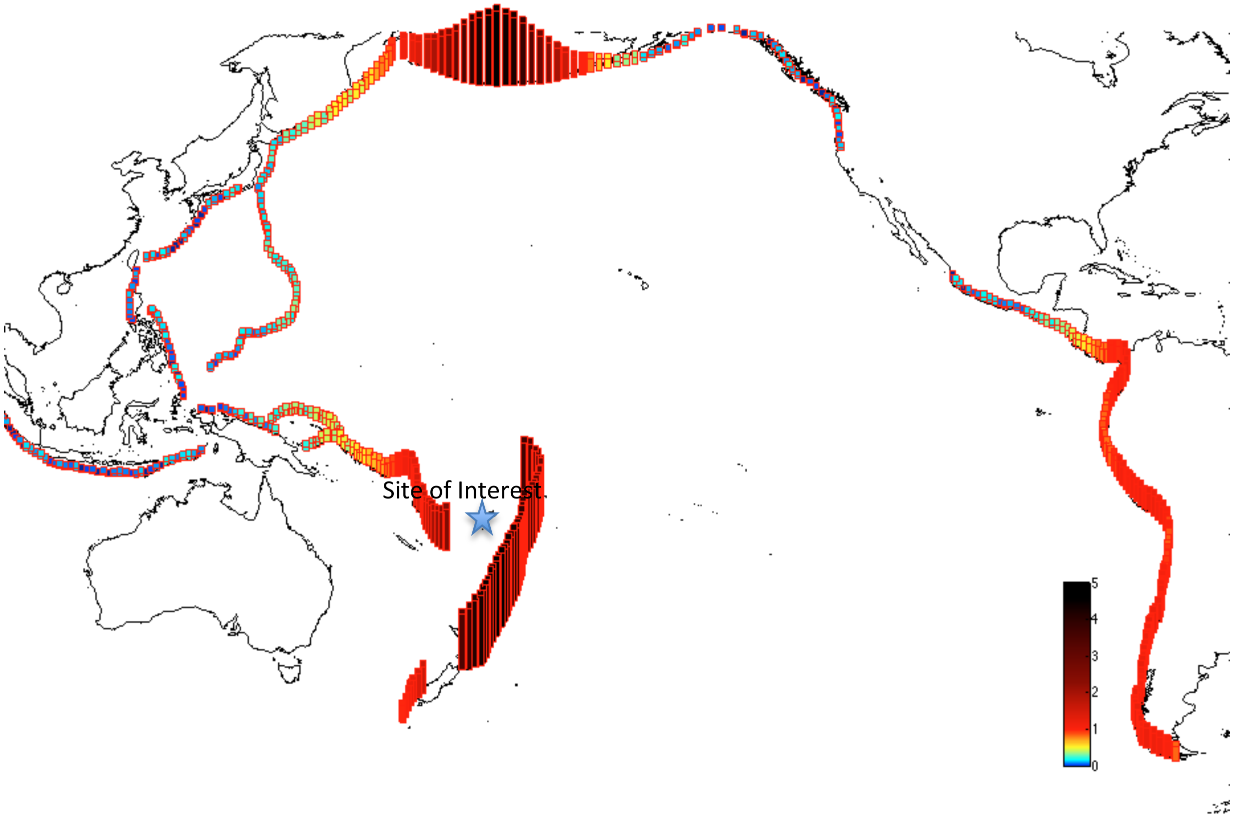


Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)

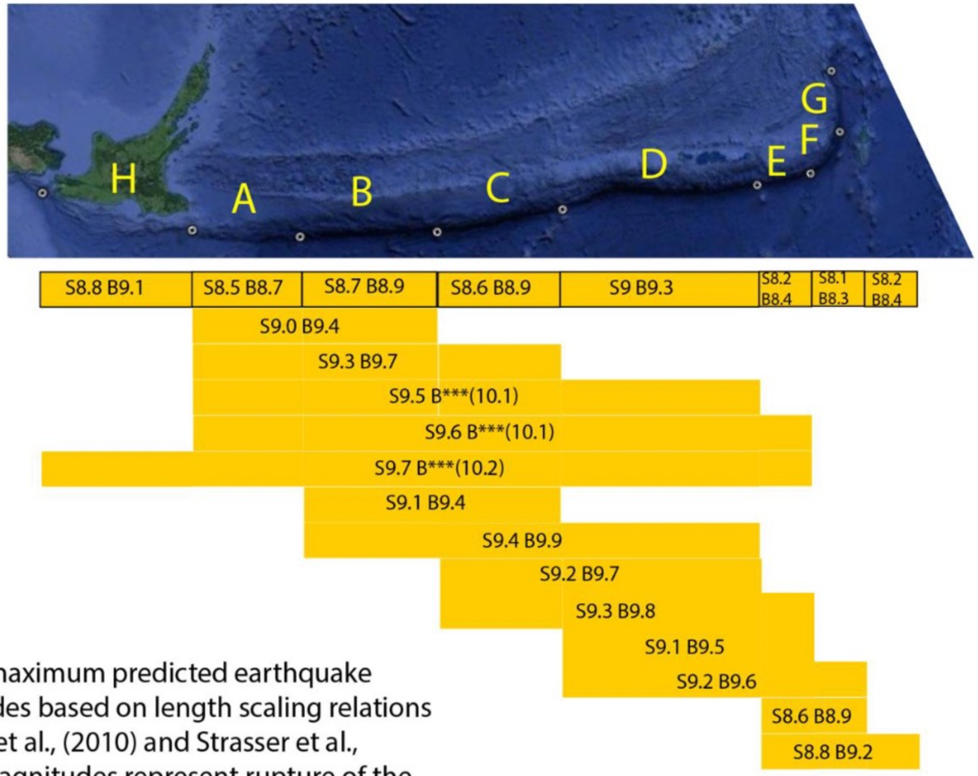


Tsunami Energy- Directivity (Kermadec-Tonga Subduction Zone)




Site of Interest
5
4
3
2
1
0

Estimation of Tsunami Sources Along the Tonga-Keramdec Subduction Zone



Median maximum predicted earthquake magnitudes based on length scaling relations in Blaser et al., (2010) and Strasser et al., (2010). Magnitudes represent rupture of the entire segment(s).

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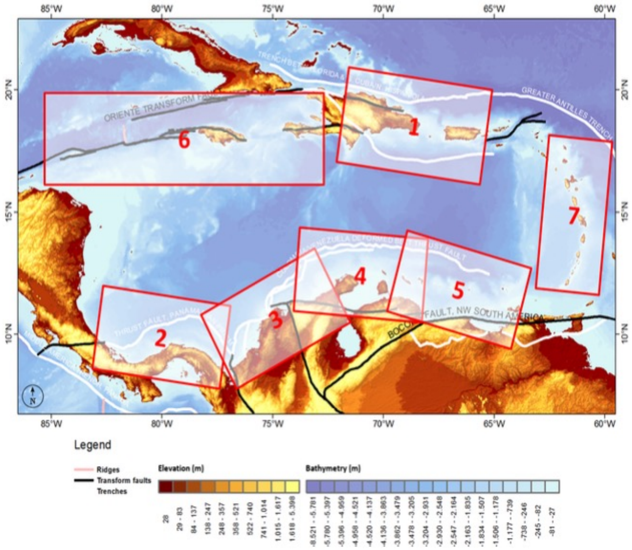

Figure 10.-General overview of main tectonic structures (from http://ig.utexas.edu/marine-and-tectonics/plates-project/; background elevation from GEBCO08). Red boxes include the following sources: box 1, near sources (WMT, SMT1, SMT2, MS, PRT, MEF, CS); boxes 2 to 5: distant sources (NPDB, WSCDB, FSCDB); boxes 6 and 7 other sources (not included in **Erreur ! Source du renvoi introuvable.**).

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Scenario	Lat	Lon	Water/EQ Depth	Strike	Dip	Rake	Slip	Length	Width	Mw
1. WMT	17.6	-69.5	2.7/2.5	280	9	90	4	290	30	8.0
2. SMT1	17.6	-70.0	3.8/2.5	285	11	90	3	140	25	7.6
3. SMT2	17.4	-68.7	3.7/2.5	275	10	90	3	150	25	7.6
4. MS	17.7	-69.8	2/3.5	279	14	90	3	190	20	7.7
5. NPDB	9.8	-77.8	25	142	40	90	10	243	80	8.5
6. WSCDB	12.3	-73.7	25	53	17	90	7.4	500	90	8.6
7. ESCDB*	13.1	-69.3	20	96	20	90	8.03	500	90	8.7
8. FSCDB**	**Composite sources (WSCDB + ESCDB) **									
9. PRT	19.3	-66.5	20	86	20	23	8.0	500	110	8.7
10. MEF	18.3	-67.8	10	110	70	270	6.0	80	20	7.6

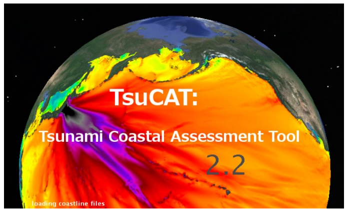
Table 1-Tsunami source parameters provided during the meeting. Lat/Long coordinates are in WGS84. Strike, dip and rake in degrees. Depth, length and width in km. Depth is expressed as Water depth / Earthquake depth in some cases. Values of event Mw were computed using the Seismic Moment relationship (see text for description). Relations between average displacement (D) and fault dimensions for M0 computations were estimated following Wells and Coppersmith (1994) equation [5.08 + 1.16 * Log(SRL)]. Source FSCDB below with star indicate a composite source using two segments; WSCDB and ESCDB, western and eastern SCDB segments, respectively.

*Eastern segment of the Southern Caribbean Deformed Belt was not simulated as a single source.

** Entire rupture of the Southern Caribbean Deformed Belt using both western and eastern segments.

Scenario	Lat	Long	Water Depth (km)	Volume
CS	17.6	-69.6	3.4	320 km2 x 0.7 km = 224 km3

TsuCAT: Tsunami Coastal Assessment Tool (NCTR, ITIC)

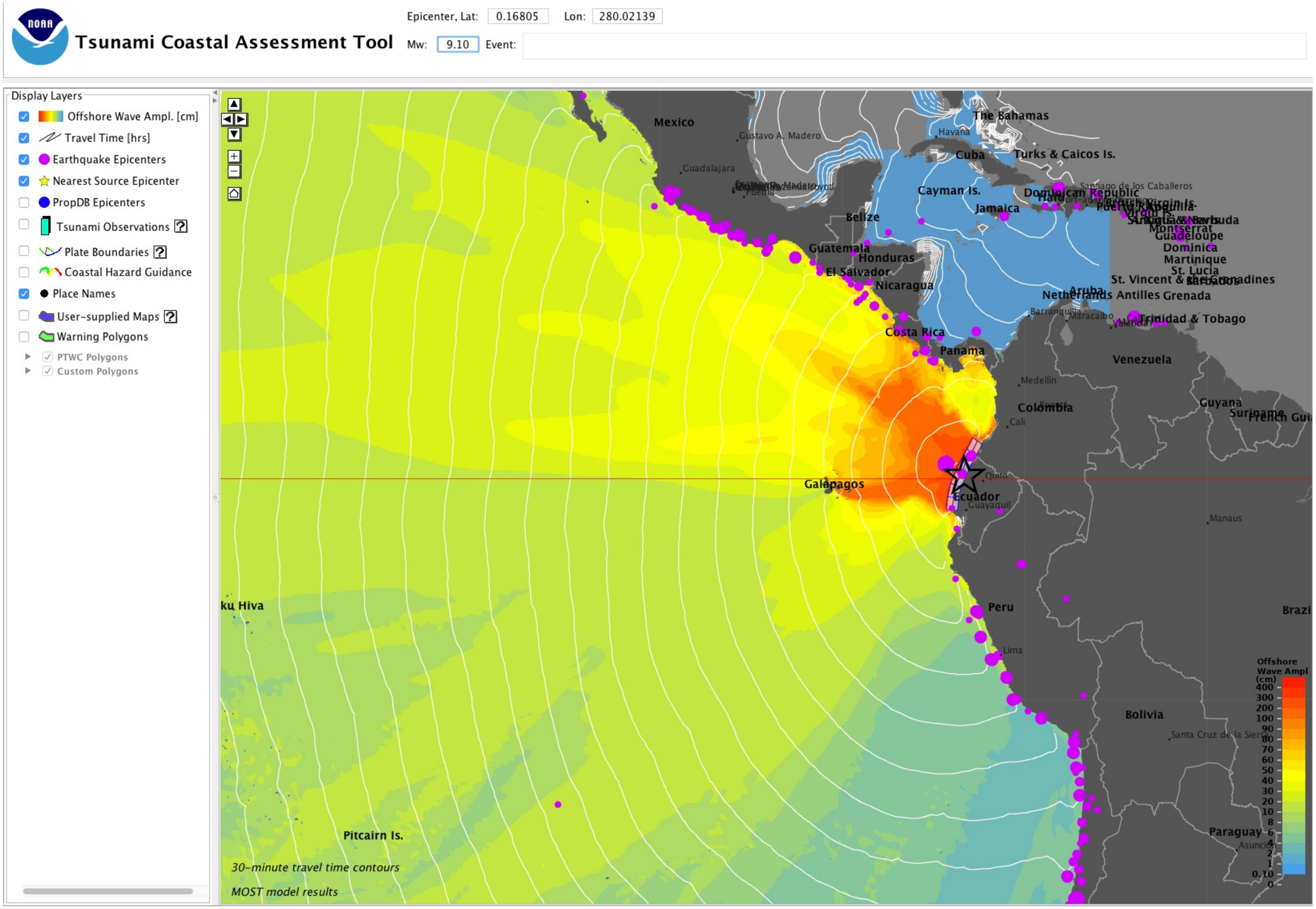


- Why / What: Request by Pacific Islands for warning DSS
  Gives country capacity to assess tsunami hazard
- Tool use:
  - Planning tool - assess threat before – ‘energy beams’
  - Decision system support tool – Customize country sub-regions (polygons), Quick, early assessment through DB lookup
  - Exercise tool – develop scenarios to use (v4.0, April 2019)

☐ Features:

- Database: ~5000 earthquake scenarios from along active subduction zones, Pacific, Caribbean, Indian Ocean (M6.5-9.5)
- Results from NOAA models (MOST/SIFT (M8+), RIFT (M6.5-7.9)
  - Offshore max amplitude / coastal wave amplitude (Green’s Law)
  - PTWC or User custom forecast polygons

Source Impact Estimation Tools: TsuCat



Tsunami Coastal Assessment Tool

Epicenter, Lat: 0.16805 Lon: 280.02139

Mw: 9.10 Event:

Display Layers

- ☑ Offshore Wave Ampl. [cm]
- ☑ Travel Time [hrs]
- ☑ Earthquake Epicenters
- ☑ Nearest Source Epicenter
- ☐ PropDB Epicenters
- ☐ Tsunami Observations
- ☐ Plate Boundaries
- ☐ Coastal Hazard Guidance
- ☑ Place Names
- ☐ User-supplied Maps
- ☐ Warning Polygons
  - ☑ PTWC Polygons
  - ☑ Custom Polygons

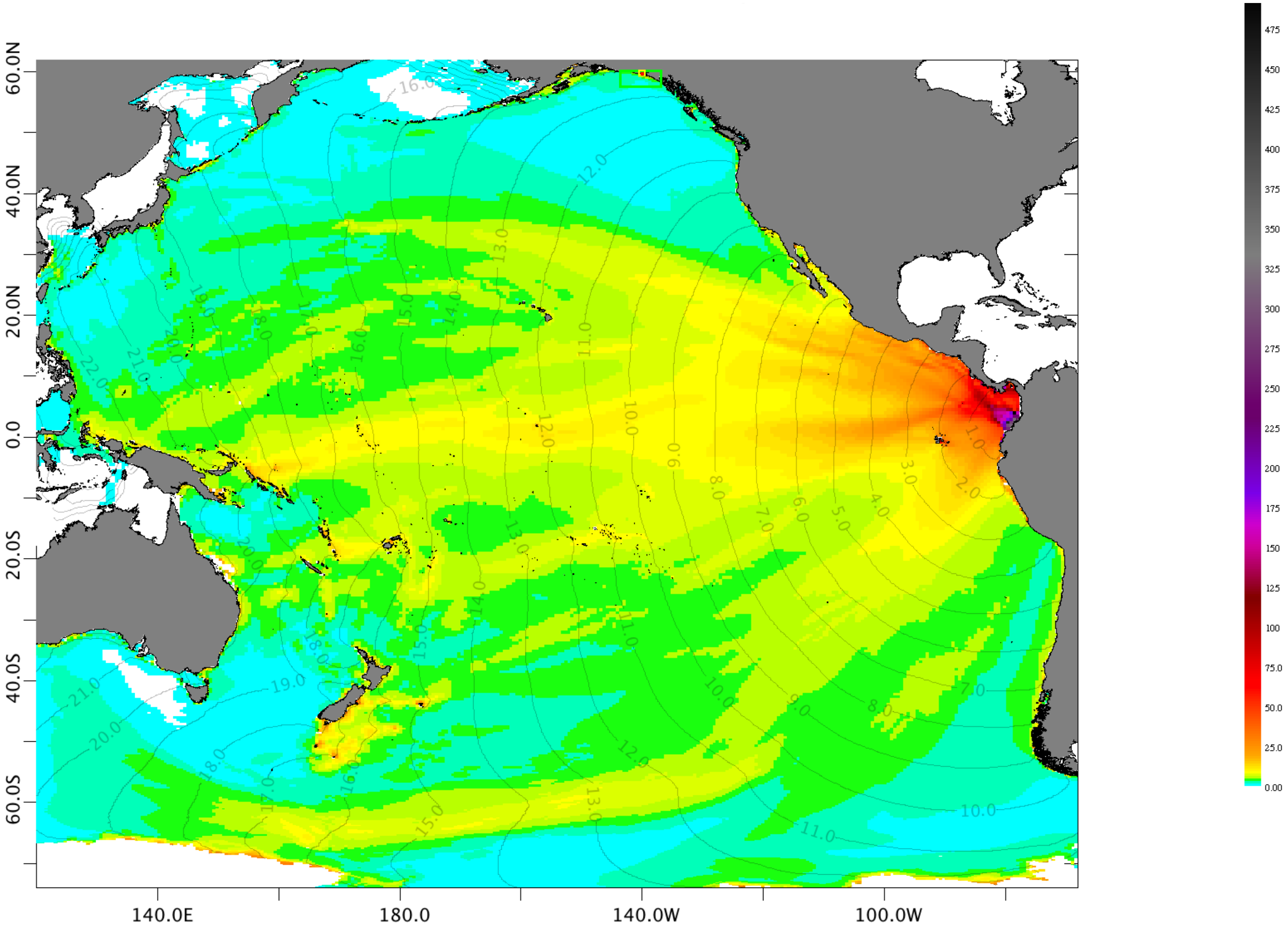
ComMIT: Community Model Interface for Tsunamis

- Why / What: ComMIT is a Graphical User Interface to the Tsunami Numerical Code, MOST.

- Tool use:
  - Inundation modeling of at-risk communities.

- ❑ Features:
  - Online access to the NOAA database of unit sources with full-basin visualization of max amplitude.
  - DEM generation assistance tool.
  - Access to NCTR database of historical event sources.
  - Real-time visualization of model solutions.
  - Tool to create composite wave files into GIS

Source Impact Estimation Tools: ComMIT



Thank You
Have a Productive Workshop