

Introduction

New Caledonia and Vanuatu are vulnerable to local, regional, and distant tsunamis generated around the Pacific. NOAA's National Centers for Environmental Information (NCEI) and co-located World Data Service (WDS) for Geophysics, and the International Tsunami Information Center (ITIC), a UNESCO/IOC-NOAA partnership, have collaborated to produce a poster showing historical tsunami effects in New Caledonia and Vanuatu. NCEI/WDS provides long-term archive, data management, and access to global tsunami data. ITIC works to mitigate the effect of tsunamis throughout the Pacific, and has collected post-tsunami event information to support hazard assessment since its inception in 1965.

New Caledonia and Vanuatu lie on either side of the New Hebrides Trench, a convergent plate boundary where the Australia plate subducts eastwards beneath the Pacific. Along this boundary the convergence rate between the Australian and Pacific plates has been estimated as 60–120 mm per year. Large subduction zone earthquakes are most common along the northern portion of the New Hebrides Trench, though occasional strike-slip earthquakes occur near the D'Entrecasteaux ridge. A reverse fault in the back-arc of Vanuatu is segmented by transverse faults. In 1999, the reverse fault generated one of two known deadly events in the region. A total of 17 volcanoes are in the area, however, none are known to have generated a historical tsunami.

Tsunamis in New Caledonia and Vanuatu

Examination of the NCEI/WDS Global Historical Tsunami Database reveals that the earliest confirmed historical account of a tsunami impacting either New Caledonia or Vanuatu was in 1849. This tsunami was generated by an earthquake off of Kamchatka, Russia, and was observed in Vanuatu. The first tsunami observed in both New Caledonia and Vanuatu was generated by an earthquake off of Loyalty Islands in 1875. This tsunami resulted in 25 deaths and a 2.5 meter wave at Lifou Island, New Caledonia. The only larger recorded tsunami wave in New Caledonia was the 3 meter tsunami wave in 1942 generated by an unknown source, a local earthquake and/or landslide are suspected sources.

The only other confirmed historical tsunami to cause deaths in the region occurred in 1999, generated on the previously described reverse fault in the back-arc of Vanuatu. The tsunami resulted in a 6.6 meter wave and five deaths at Baie Martelli, Vanuatu, though the death toll could have been much higher had it not been for indigenous knowledge as well as public outreach conducted three weeks prior by the Vanuatu National Disaster Management Office. The highest historical tsunami wave runup in Vanuatu is 12 meters on Tanna Island generated by a nearby earthquake in 1878.

Distribution of Tsunami Sources

From 1849 to 2019, there were over 75 confirmed tsunamis observed in New Caledonia and Vanuatu. Approximately 40% of the tsunamis were observed only in Vanuatu, while just under 25% were observed only in New Caledonia. Approximately 35% of the tsunamis were observed in both island groups. Of these confirmed tsunami observations, approximately 55% originated from local/regional sources (<1000 km from the observed location).

Vanuatu has observed tsunami waves primarily from local/regional sources (70%). Moreover, Vanuatu has not observed runups >2m from sources ≥200 km in distance.

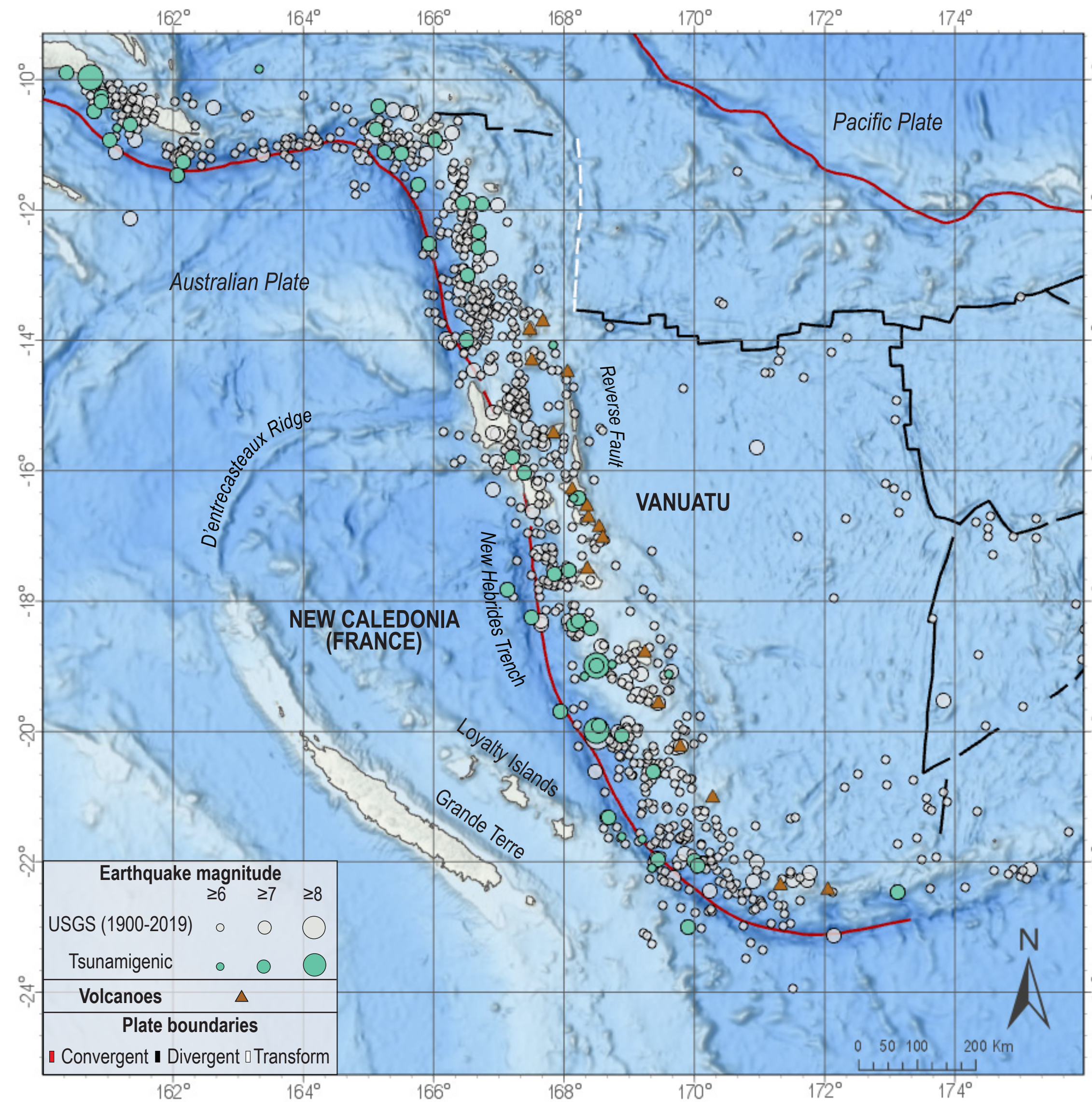
Approximately 60% of tsunami waves observed in New Caledonia were from distant sources (>1,000 km). New Caledonia has observed tsunami waves ≥1 m from three separate distant source tsunami events.

After 2001, the tide gauge network in the region was expanded, resulting in increased detection of small amplitude tsunamis. A total of 59 tsunami events have registered on tide gauges in New Caledonia and Vanuatu. Of the tsunami events detected by tide gauges, less than 20% were also observed by eyewitnesses or post-tsunami surveys. As a result, tide gauges are historically important to observing tsunamis in New Caledonia and Vanuatu, particularly distant source tsunami events which account for 50% of tsunami tide gauge observations.

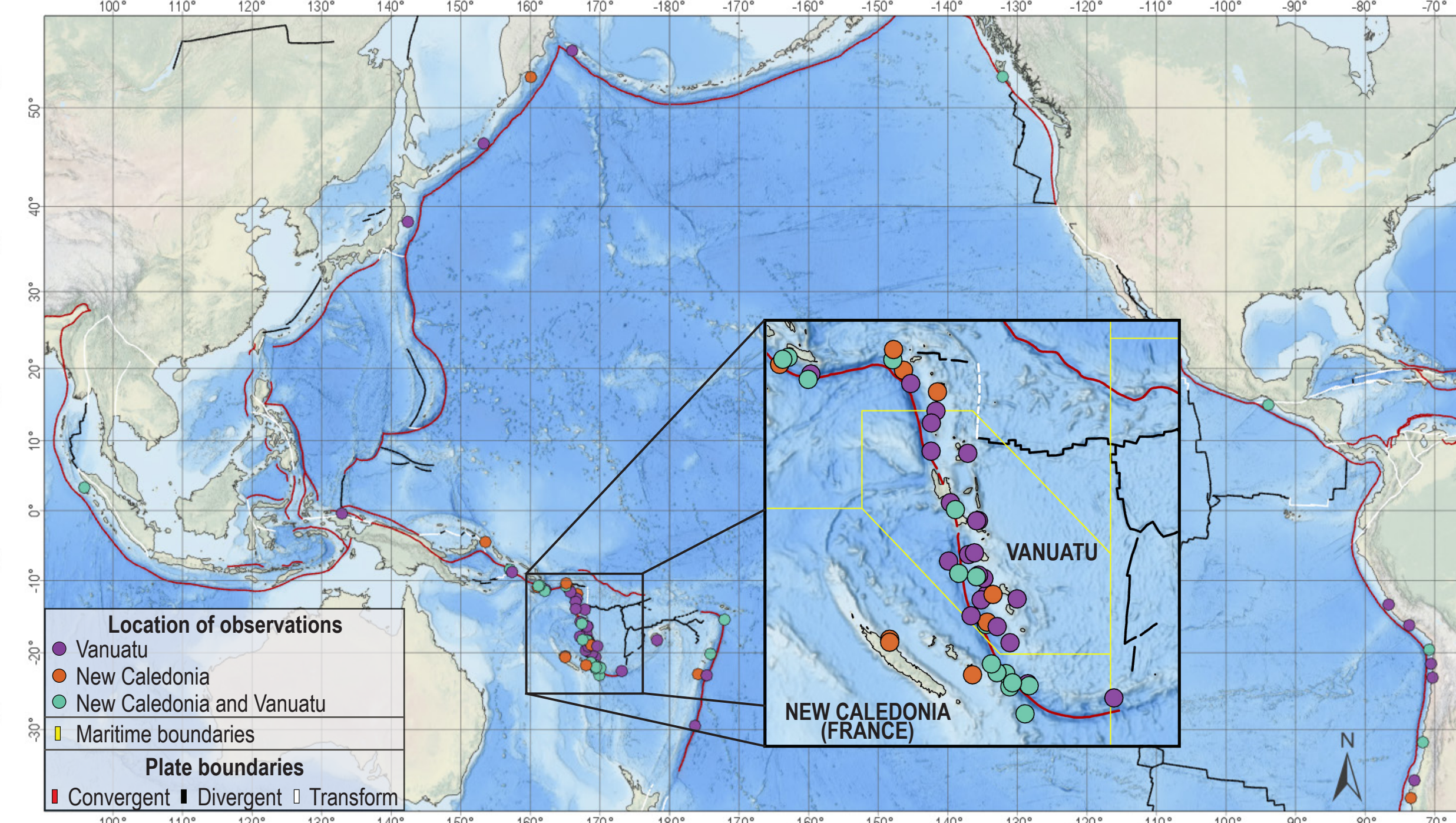
The village of Baie Martelli, Vanuatu, was destroyed after the 1999 tsunami. The large concrete village church (center image) was one of the few structures that remained standing following the tsunami. However, water surged over the top of the church (over 4 m above ground surface), crushing its corrugated metal roof. (Image Credits: Costas Synolakis (left), Utku Kanoglu (center, right))



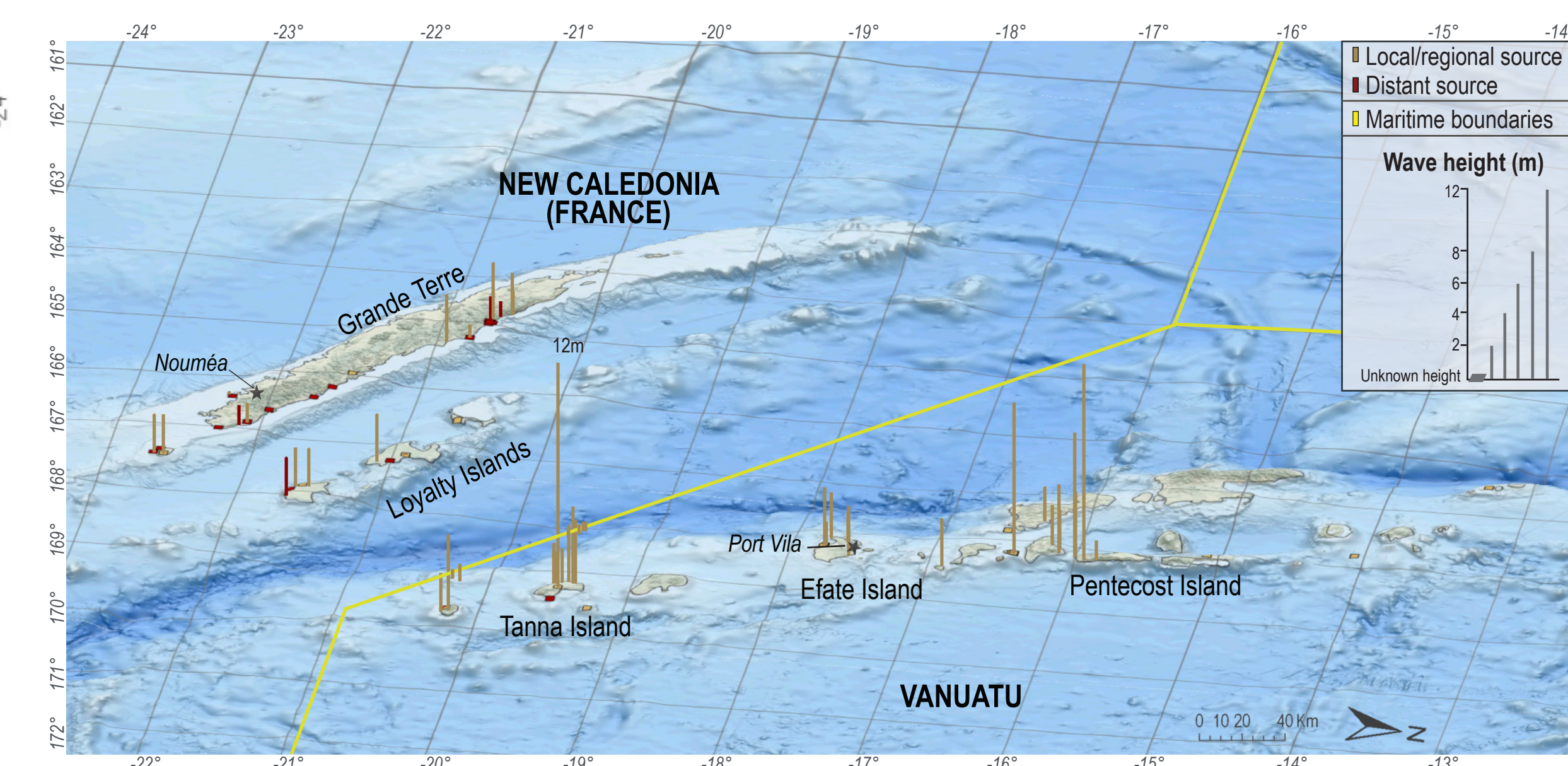
Regional Geologic Context



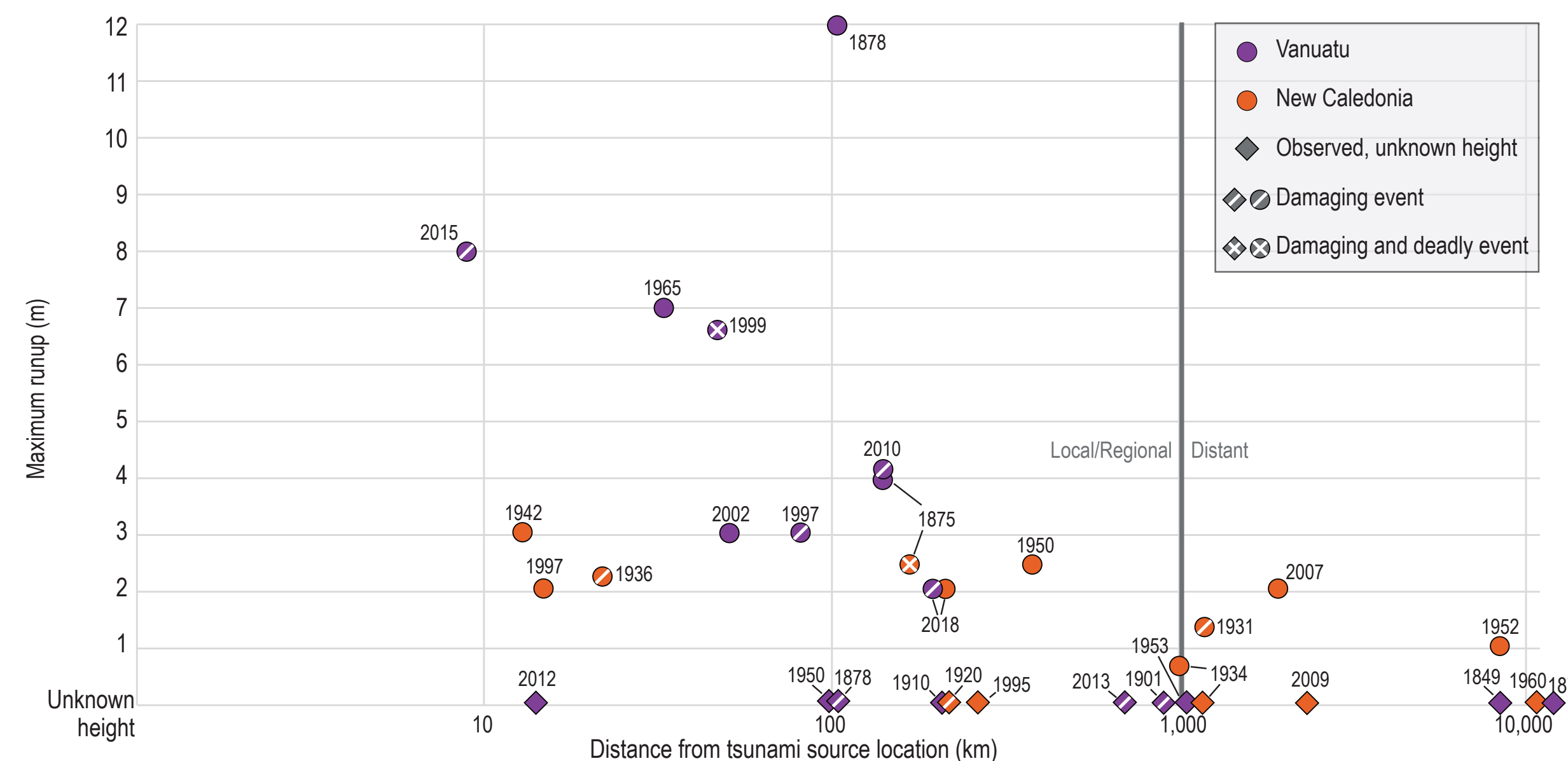
Confirmed Tsunami Source Locations



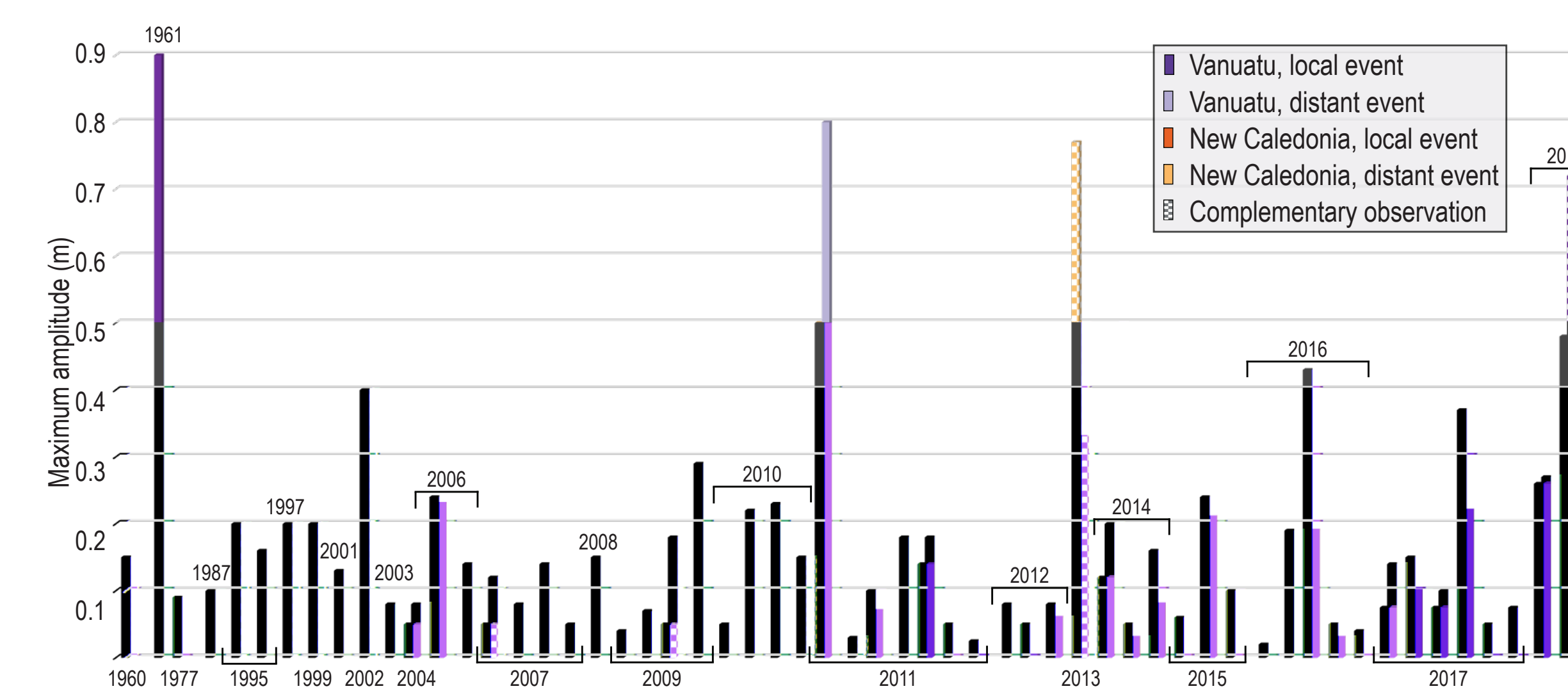
Historical Tsunami Observations: Eyewitness or Post-tsunami Survey



Maximum Tsunami Runups



Historical Tsunami Observations: Tide Gauge



Note: complementary observation indicates an eyewitness or post-tsunami survey observation also exists for the tsunami event.