Preparations for a mega-earthquake in northern Chile: How to convey geoscience to the authorities

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Not unlike western Canada's, the geological setting of Chile overlying active plate subduction implies periodic recurrence of mega earthquakes such as the Magnitude 9.5 Valdivia Earthquake that killed 1655 persons and displaced millions. The imminence, magnitude, epicenter, probable duration and extent of the threatened region of a mega earthquake to be feared in southern Chile near Concepcion were published in an international refereed journal in June 2009. A Chilean doctoral student defended a thesis in Germany on February 23rd 2010; yet when the Magnitude 8.8 earthquake hit the exact region February 27th, it caught the civil and military authorities by surprise. More than 525 people died, 120 due to a tsunami that affected a coastal area similar to that documented by Charles Darwin after a comparable mega-earthquake in 1835. A few informed geoscientists had tried to convey the urgency through public lectures and the press, but were ignored or dismissed as alarmist. The legal and political fallback has affected emergency organizations and even the Chilean President at the time.

Now we must prepare for another major earthquake and tsunami in Northern Chile, between Antofagasta and southern Peru (600 km). There is a worrisome seismic gap, where the subducting plate is jammed, and accumulating elastic energy since 1877. Solid data such as measurable deformation and uplift of the land area as recorded by GPS and satellite tools, visible fault scarps, and micro- seismicity indicate that the threat is real. The sudden release of this accumulated elastic energy will result in an earthquake of Magnitude 8 to 9, and create a tsunami such as that experienced 137 years ago in the same region. The consequences will be disastrous in a region with many large mines (tailings dams and metallurgical installations) and pipelines that are essential to the economy. Along the coast, thermoelectric and desalinisation plants, as well as industrial port facilities and populated cities, will endure effects predictable from historical records.

In an effort to minimize the impact of the unavoidable natural disaster, we organized successful workshops and field excursions in Vancouver in 2010 and port cities in northern Chile in 2011 that involved civil and military emergency management authorities. These activities attracted valuable press publicity and we believe contributed to awareness. University teams with international collaboration are carrying out research associated to seismic risks, to better understand the seismic cycle, the role of crustal deformation and specific seismic danger in priority areas.

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