

# Killer waves on the airwaves: New media, traditional media, and student conceptualization of tsunamis

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## **INTRODUCTION**

This paper addresses the hypothesis that, after 26 Dec. 2004, media coverage, and more specifically "new media," affected students' understanding of, and interest in, tsunamis. To test this hypothesis, 13 years of media reports on tsunamis were reviewed and 146 students surveyed regarding their knowledge of the phenomenon in the aftermath of the 11 March 2011 Japan earthquake and tsunami.

# BACKGROUND

The overarching goal of science educators is the achievement of scientific literacy (National Research Council, 1996). The means for achieving it vary, but it has been suggested that covering material relevant to students' lives (Cervato et al., 2009, and references therein) and leveraging students' fascination about natural disasters help them develop deeper understandings of these phenomena (e.g., Welch, 2006). Lee (1999) studied Florida children's conception of hurricanes after they experienced Hurricane Andrew in 1992. She argued that since learning through personal experience may lead to understanding that is not compatible with the nature of science or scientific knowledge, it is important to be aware of students' ways of knowing and thinking about science.

Students who do not live in areas impacted by natural disasters learn about these events through news media, movies, or in school (e.g., Parham et al., 2011). A study of the impact of news media on students' understanding of earthquakes (Barrow and Haskins, 1996) suggests that while mass media expose them to the cause and effects of earthquakes more than direct experience, the focus of media on large, devastating events can fuel the misconception that tectonic plates move only rarely.

Since Barrow and Haskins's (1996) study, the spectrum of mass media has expanded from print and TV and radio broadcasting to include "new media," such as YouTube and other Internet sources. Houston et al. (2008) found that while reports of Hurricane Katrina and other disasters represent teachable moments for youth, their portrayal in the media has been so influential as to cause posttraumatic stress symptoms in younger viewers.

## **TSUNAMI IN NEW AND TRADITIONAL MEDIA**

To test whether the media deserve credit for the sudden increase in worldwide concern regarding tsunami, the occurrence of the term "tsunami" in major world publications since December 1997 using the LexisNexis Academic news database was collected. The major world publications file of LexisNexis includes more than 700 news sources known for their content reliability. The search protocol for this study approximates the method used in a more general study of occurrences of geoscience terms in the news (Cervato et al., 2009), though the search was restricted to the topic "natural disasters" to exclude non-geologic usages of *tsunami*. Out of 309 occurrences in a random 14-day period in February 2011, 87 (28%) were categorized under "natural disasters"; others were in categories as varied as "elections" and "health and medicine."

Pre–December 2004 data were collected for one-year intervals. Beyond 26 Dec. 2004, daily averages were computed within threemonth bins (Fig. 1). To capture the effect of the 11 Mar. 2011 tsunami, the Dec. 2010 to Mar. 2011 period is plotted twice: once from 11 Dec. 2010 to 10 Mar. 2011 and once from 29 Dec. 2010 to 28 Mar. 2011.

Prior to 2004, the most recent significant tsunami event occurred on 17 July 1998 in Papua New Guinea, sparking 1.38 average daily news reports over one year. Afterward, tsunami reports averaged <1 per day until 26 Dec. 2004. In the two weeks thereafter, the term occurred 12,530 times (835 daily average occurrences). The daily occurrence until Mar. 2005 was 161. In the following year, this gradually declined to ~30. After the one-year anniversary of the Sumatra event, coverage stayed at ~15 reports per day, rising slightly when three other tsunamis hit the news. The M9.0 earthquake near Japan on 11 Mar. 2011 generated a tsunami wave across the Pacific Ocean and a wave of media interest comparable yet smaller than the one at the end of 2004: 9194 news reports in the 14 days following the event—an average of 656 daily reports.

The 2004 event coincided with the birth of YouTube, which made its official debut in November 2004, meaning dozens of amateur videos taken by tourists who witnessed the event were suddenly readily available on the Internet.

Google Earth, another new media source released in 2005, allows people to visualize the effects of natural disasters with unprecedented speed and detail. While "before and after" satellite images of areas affected by the 2004 tsunami were posted on the NASA site 15 days after the event (http://tinyurl.com/3sxhuwg), Google Earth released higher resolution pre- and post-event images of the 2011 Japan tsunami less than two days after the event (http://tinyurl.com/49arhx9).

Widespread coverage of tsunamis in the media coincided with deeper coverage of tsunamis in many introductory geoscience curricula, as suggested by the jump from two pages in the first edition of an introductory geology textbook (Marshak, 2001) to five pages in the third edition (Marshak, 2008).

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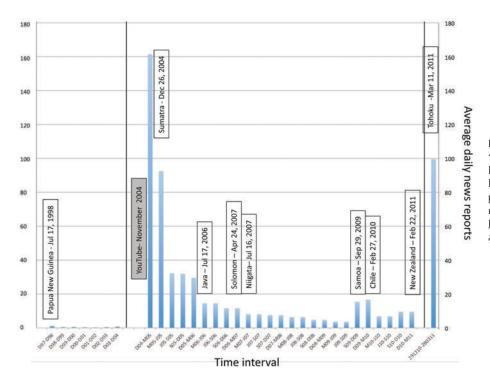


Figure 1. Average daily news reports with term "tsunami" since December 1997. Data in the left part of the figure were calculated over yearly intervals, the remainder over three-month periods. The public unveiling of YouTube and major tsunami events are identified. M—March; J—June; S—September; D—December. Years are identified by their last two digits.

The impacts of the 2004 Indian Ocean tsunami go beyond the huge loss in human lives and the far-reaching environmental and economic consequences. The event initiated a "lexical shift" in media reports from the incorrect popular term "tidal wave" to the scientifically accepted "tsunami" (Clark, 2010). Further, media have also popularized the term "tsunami" beyond its original scientific usage: the political "tsunami" sweeping through North African countries this winter (J. Githongo, *The East African*, 14 Feb. 2011) causing a potential "human tsunami" to hit Italy (Italian PM Berlusconi quoted in *Corriere della Sera*, 2 Apr. 2011).

#### **TSUNAMIS AND STUDENTS' CONCEPTIONS**

Given the intensity of coverage from multiple media sources, one might expect students' understanding of tsunamis to be better now than prior to 2004. However, a 14-question survey (http://tinyurl.com/6g7jxlp) of 146 students (73% of the class) enrolled in an introductory meteorology course taught by the author and administered online between 29 March and 2 April 2011 shows that significant misconceptions remain. Tsunamis were not part of the course curriculum, and students received a small amount of extra credit for completing the survey.

The vast majority of students surveyed were between 18 and 22 years old. While 77.4% had taken an Earth science class in middle or high school and 44.5% had taken one in college, 47.3% declared that they first heard of tsunamis in the news, 40.4% in school, and 12.3% from a Hollywood movie. Most students surveyed (84.9%) knew the correct possible causes of tsunami. However, 54.8% believed that tsunamis are affected by climate change.

Two thirds of students surveyed identified a tsunami as a single wall of water (28.8%) or several long waves in the ocean (35.6%); 28.1% believed they are related to tides. On the other hand, 32.9% of them identified "harbor wave" as the correct meaning of the Japanese word "tsunami." Finally, 23.3% of students thought that tsunamis are about as frequent now as in the geologic past, while the majority (73.6%) thought that tsunamis are somewhat or much more frequent now.

These results suggest that most students know a lot about tsunamis, perhaps due to heavy media coverage. However, there are no data to prove this beyond the perception of a marked difference in students' interest before and after 2004 as suggested by their questions in class. Many students hold two significant misconceptions: (1) that tsuna-

mis are affected by climate change, and (2) that tsunamis are becoming more frequent. This suggests that the true causal mechanism of tsunamis remains unclear, and that students may be erroneously assuming, in reaction to the increased visibility of tsunamis in the media, that their rate of occurrence has increased.

#### **CONCLUSIONS**

New visual media, such as YouTube and Google Earth, present geoscience educators with an opportunity to engage students in the understanding of dynamic Earth processes in powerful new ways. However, after 2004, traditional and new media have transformed the term "tsunami" into a household word that is now commonly used by people all over the world and in a broad range of nongeologic contexts. In spite of this popularity, students still hold challenging misconceptions about why, and how often, tsunamis occur.

#### **REFERENCES CITED**

- Barrow, L., and Haskins, S., 1996, Earthquake knowledge and experience of introductory geology students: Journal of College Science Teaching, v. 26, p. 143–146.
- Cervato, C., Ridky, R., and Jach, J., 2009, News media databases for content selection and relevance in introductory geoscience courses: Journal of College Science Teaching, v. 39, p. 34–37.
- Clark, S., 2010, A shift in scientific literacy: Earthquakes generate tsunamis: Eos (Transactions of the American Geophysical Union), v. 91, p. 316–317.
- Corriere della Sera, 2011, Berlusconi: 100 rimpatri al giorno Appello a Tunisi: «È uno tsunami umano»: Corriere della Sera, 2 Apr. 2011, http://www.corriere.it/ politica/11\_aprile\_01/immigrazione-piano-cabina-regia\_ef3d7c94-5c38-11e0-b06c-b43ad3228bba.shtml.
- Githongo, J., 2011, The perfect storm is coming, are you ready?: The East African, 14 Feb. 2011, reprinted in The State of Hope blog, http://johngithongo.wordpress. com/2011/02/16/the-perfect-storm-is-coming-are-you-ready/.

- Houston, J., Pfefferbaum, B., and Reyes, G., 2008, Experiencing disasters indirectly: How traditional and new media disaster coverage impacts youth: The Prevention Researcher, v. 15, no. 3, p. 14-17.
- Lee, O., 1999, Science knowledge, world views, and information sources in social and cultural contexts: Making sense after a natural disaster: American Educational Research Journal, v. 36, p. 187–219.
- Marshak, S., 2001, Earth: Portrait of a Planet (first ed.): New York, W.W. Norton, 735 p.
- Marshak, S., 2008, Earth: Portrait of a Planet (third ed.): New York, W.W. Norton, 832 p.
- National Research Council, 1996, National science education standards: Washington, D.C., National Academies Press, 262 p.
- Parham, T., Cervato, C., Gallus, W., Larsen, M., Hobbs, J., and Greenbowe, T., 2011, Are movies and popular media driving students' poor understanding of volcanic processes?: Journal of College Science Teaching, v. 41, no. 1, p. 14–19.
- Welch, M., 2006, What happens to animals during hurricanes?: Science Scope, v. 29, no. 5, p. 14–19.

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.org/pubs/gsatguid.htm.