

**Final Report  
2005 SCEC**

**Teacher Workshop at the Visualization Center at Scripps Institution of  
Oceanography**

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## ***2005 Teacher Workshop at the Visualization Center at Scripps Institution of Oceanography***

### **Project Summary**

SCEC funds were used to help offset the cost of our 3rd annual Teacher Workshop held on 19 August 2005 (<http://www.siovizcenter.ucsd.edu/workshop>) at the Scripps Institution of Oceanography's Visualization Center (Figure 1; see Appendix A for the full workshop agenda). Similar to past Teacher Workshops at SIO, the 2005 Workshop was a collaborative effort that included members from various sub-disciplines and five institutions, which included:

- Southern California Earthquake Center (SCEC)
- U.S. Geological Survey (USGS)
- Scripps Institution of Oceanography's (SIO)
- Institute of Geophysics and Planetary Physics (IGPP)
- Birch Aquarium at Scripps (BAS)

**Additional photos from the 2005 SIO Teacher Workshop can be found at:**  
<http://www.siovizcenter.ucsd.edu/workshop/photos/photos.html>



**Figure 1:** *The 2005 Teacher Workshop at the Scripps Institution of Oceanography's Visualization Center. Participants in the workshop were introduced to Earth science concepts and images on the wall sized curved Panoramic screen, which gives the viewer a feeling of immersion within the images and data.*

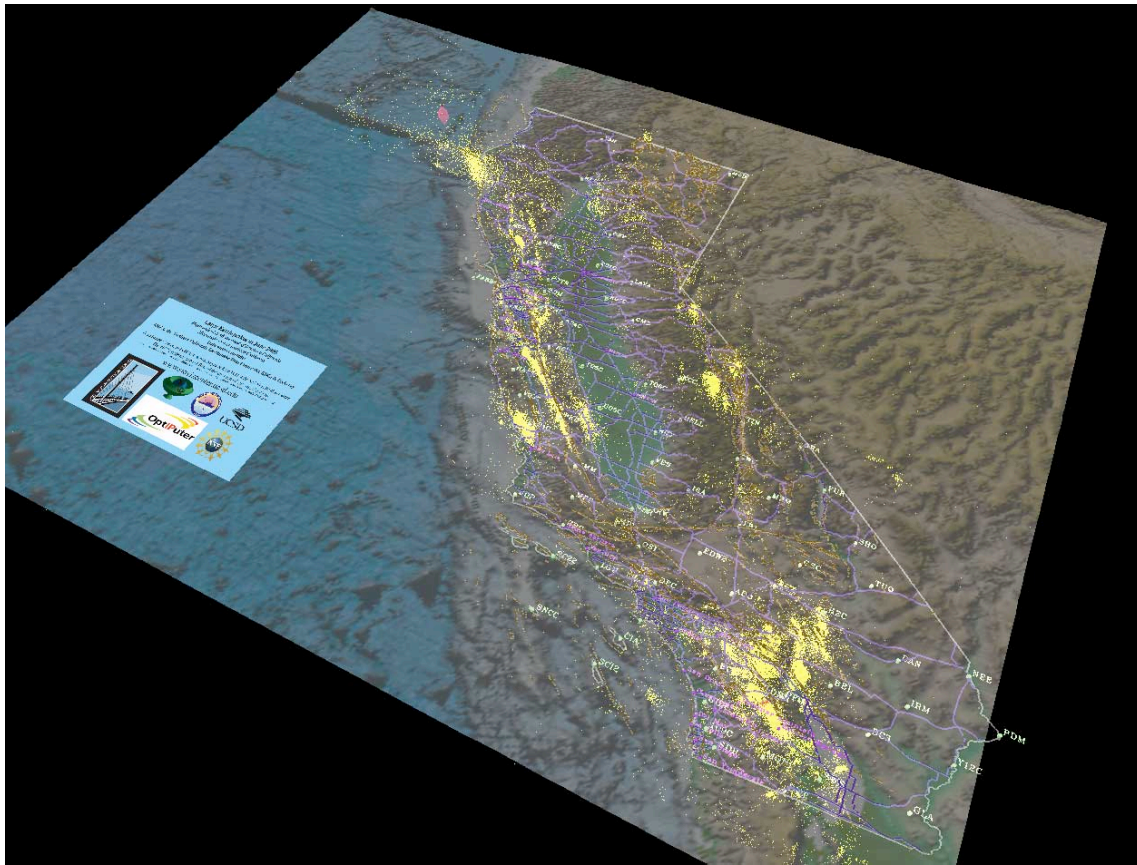
## 1.0 The 2005 Teacher Workshop at the Scripps Institution of Oceanography

One goal of the 2005 Teacher Workshop at the Scripps Institution of Oceanography (SIO) Visualization Center was to help serve the needs of teachers in the San Diego region in their professional development. We aimed to empower the teachers with the appropriate Earth science background so that they could teach Earth Science in ways that were engaging and effective. Additionally, the teachers gained pedagogical skills and resources required to convey concepts that are inherently 3-D in nature in ways that can be internalized by students. This expanded the teachers current repertoire of limited 2-D representations (maps or cross sectional views) of concepts like fault plans and subduction zones, to include 3-D interactive visualizations using current-day data that can be manipulated and viewed interactively. This introduced teachers, and in turn their students, to freeware 3-D technological tools for use at home and in the classroom. The SIO 2005 workshop differed from the past SIO workshops in that it also included a trip to the Birch Aquarium at Scripps to explore the current *Earthquake: Life on a restless planet* exhibit (Figure 2).

Teaching tools that we introduced at the 2005 SIO workshop included QuickTime movies, which can either be downloaded to local computers or displayed directly over the internet, as well as iView3-D ‘scene files.’ These 3-D interactive ‘scene files’ can be viewed using the freeware program iView3-D (<http://www.ivs.unb.ca/products/iview3d/>). This software runs on multiple platforms (Windows NT, Mac OSX, SGI, Sun, PC Windows2000 and PC Linux), and is easy to use and install (installation time is typically 5-10 minutes). Mark Benthien also discussed and showed the eye-catching movie “TeraShake”, which is a model of a large earthquake occurring on the southern San Andreas Fault in California. The immediate response to this movie from the teachers: ‘Play it Again!’



**Figure 2:** This year’s workshop included a trip to explore and learn about the museum exhibit *EARTHQUAKE: LIFE ON A RESTLESS PLANET* at the Birch Aquarium at Scripps.



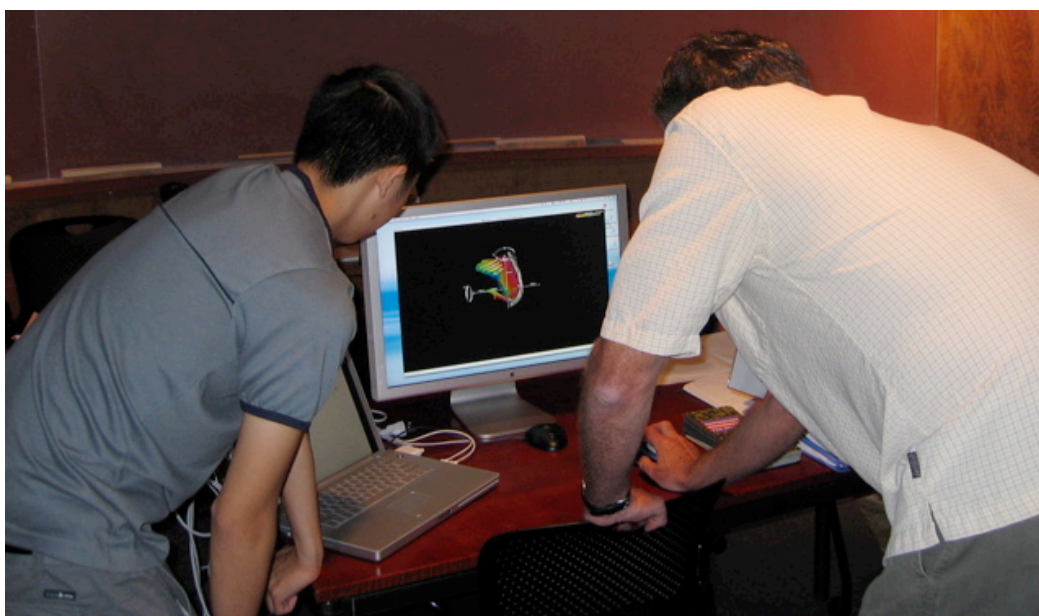
**Figure 3:** A snapshot of topography and seismicity in California. The full 3-D structure of these data is best understood through interactive 3-D exploration of the data.

The SIO Visualization Center uses state-of-the-art computer hardware and software tools for presenting and manipulating very large datasets (<http://www.siovizcenter.ucsd.edu>). The center is powered by a SGI® Onyx 3400 graphics supercomputer that can incorporate and process large amounts of data that are impossible to render on the smaller systems. Using the technology at our center, we can render 3-D interactive data modules “visual objects” that can be exported to almost any system (Windows NT, Mac OSX, SGI, Sun, PC Windows2000 and PC Linux). This allows access to high quality 3-D interactive teaching tools, yet reduces hardware costs for an in-class visualization system to the cost of a low-end laptop (~\$1,000). Over the past 3-years of Teacher Workshops at SIO we found 3-D interactive teaching materials key in conveying the nature of 3-D data (Figure 3). However, a common problem is that the technologies to display and explore 3-D data are frequently developed without consulting classroom teachers. As teachers’ time becomes more and more valuable and the technology rapidly advances, the gap between development and practicum increases. The 2005 SIO workshop allowed us to have the teachers use the 3-D interactive visualizations, and obtaining direct feedback (Figure 4 & 5). This allowed us to identify the needs of the teachers on the spot and immediately refine our goals.





**Figure 4:** Over the course of the 2005 workshop the teachers often peppered the workshop leaders with question after question.



**Figure 5:** Available to the teachers was a one-on-one session with the workshop staff to learn and give feedback on the 3D interactive iView3D software. Use of this freeware was encouraged as there are numerous earth science visualizations available for download from the SIO visual objects library (<http://www.siovizcenter.ucsd.edu/library.php>).

## 2.0 The Great Sumatra Earthquake of 26 December 2004

Mother Nature's contribution to this year's Workshop was the devastating great Sumatra magnitude ~9 earthquake that generated a deadly tsunami in the Indian Ocean. This tragedy brought immediacy to the newly incorporated Tsunami Lesson (Figure 6). We were able to discuss the Sumatra earthquake in detail and teach the workshop participants how to research not only this earthquake, but also to learn how to acquire information about earthquakes in near-real time through web links from the workshops resources web-page (<http://siovizcenter.ucsd.edu/workshop/resources.html>)



**Figure 6:** A Tsunami module was added to the workshop this year to help explain how tsunamis are generated.

## 3.0 Follow-up Activities Lead by Educational Specialist Robert de Groot

The SIO teacher workshops provide a professional development experience that is rich in content, pedagogy, and technology. Participants have ample opportunity to share ideas and methods. Participants and workshop presenters have the capacity to share experiences from a broad range of educational and research environments. Educational specialist Robert de Groot is currently conducting follow-up activities that will focus on the following areas:

1. Professional Development
2. Classroom Implementation
3. Recruitment of Future Workshop Participants
4. Mechanism for follow-up with Workshop Participants
5. Partnership Building

Activities of the Educational Specialist's follow-up activities include:

- Establishing an open line of communication with former workshop participants, informing them about new electronic resources, current events in earthquake science, and a place to request printed and electronic resources.
- Visit a select number of the former participants at their institutions to learn about how the workshops have influenced classroom practice. The educational specialist will learn about what is being used and how it is being used. School visits will also provide an opportunity to recruit educators for future workshops and a chance to talk with science department chairs and other administrators. Emphasis will be placed on learning about how the workshops can support earthquake education within the context of the No Child Left Behind (NCLB) law.
- Develop a stronger link between the content covered in the workshops and the requirements in the California Science Content Standards. Special attention is being devoted to content related to Plate Tectonics (6th grade) and content covered in Earth Science courses (high school).
- Promote partnerships with local organizations that offer earthquake education resources (e.g., The Birch Aquarium at Scripps).
- Encourage the use of local field experiences to teach about earth science.

#### **4.0 Lessons Learned**

In general all three of the SIO workshops had a similar large volume of applicants for the workshop, however our spring 2003 workshop was better attended than either of the summer workshops (2004 & 2005). Although some of the no-shows for this year's workshop had unexpected health or transportation issues on the day of the workshop, this can't account for all of the no-shows. Forgetting about the workshop is not a likely excuse for the no-shows, as this year we placed a phone call to each workshop participant one week prior to the workshop to assure they were going to attend. Perhaps the relatively low turn out for summer workshops is a result of the teacher's flexible and non-regimented summer schedules. We plan to have our future workshops during the school year to see if we can reduce the number of no-shows. A more in depth analysis of the pre/post survey and test and additional workshop questionnaires, which will be conducted by Robert de Groot, might also help us better understand how to improve our workshops.

Similar to our past workshops, the 2005 teacher workshop put us in one-on-one contact with the San Diego educators. We have already had multiple requests for additional web-links, maps, videos and PowerPoint slides. Each of these requests has already been fulfilled. The response to these efforts we are very favorable, for example Patrick Grady (teacher at Escondido Charter High School) writes:

*"Thank you very much for your extra assistance beyond the workshop. My students will definitely enjoy all the new additions to our unit on Plate Tectonics."*



## 5.0 Future Directions & Long Term Goals

Our long-term goal is to introducing the next generation of teachers and students to teaching tools that can improve their ability to understand earth science concepts. This will provide teachers not only with standard images, global topography maps, and earthquake distribution maps, but also information on seismic tools and techniques, access to real-time seismic data, information on visualization tools available online, and access to our visual objects library (<http://www.siovizcenter.ucsd.edu/library.php>). Our aim is to enable teachers with the technical capabilities to use our products and, after the usefulness of our products is established, to reassess and update our goals to meet the changing needs of educators in the San Diego community. In each of our workshops we have tried to strike a balance between hands-on learning activities (e.g., Figures 2, 5, 7) and learning activities that used computer graphics (e.g., Figures 1 and 3). To ensure our workshop participants (Figure 8) receive continued access to some of the workshop's resources, we maintain a list of relevant websites (<http://siovizcenter.ucsd.edu/workshop/resources.html>). This information is also freely available to those who were not able to attend the workshop.



**Figure 7:** (Left) Ilene Cooper (SCEC) led the teachers through the ‘Plate Tectonic Puzzle’ activity. This activity covers concepts ranging from tectonic plate movement, direction and speed, to the theory of hot spots, the projection of our global world onto a flat-map (don’t fall off the edge!) to interpretation of elevation through color mapping. (Right) Educational specialist Bob de Groot led the group on a tour of how Mount Soledad was formed.





**Figure 8:** Sample “graduation photos” from the annual SIO Teacher Workshops. The graduation ceremony included a presentation of a course completion certificate, a number of different take-home maps, books, and teaching products to be used in the classroom.

## Appendix A: Agenda for the 2005 SIO Teacher Workshop

Earthquake Education Workshop - Agenda - 19 August 2005	
8:30-8:50am	Check-in/Coffee/Pastries (SIO Visualization Center)
8:50-9am	Welcome, Overview of the center & introduction of key people (Debi)
9-9:20am	Group introductions and/or Earthquake Icebreaker (Wendy)
9:20-9:50am	Earthquakes 101 (Debi)
9:50-10:05am	Standards (Bob)
10:05am-12:30pm	Activities Set I <ul style="list-style-type: none"> <li>● Plotting earthquake epicenters (Wendy)</li> <li>● Tectonic Plate Puzzle (Ilene)</li> <li>● Trip to balcony to see Mt. Soledad -- how was it formed? (Bob)</li> <li>● Techno-tectonics               <ul style="list-style-type: none"> <li>• Earthquakes from around the world - 3D exploration (Debi)</li> <li>• Allan Jones program (Jose)</li> <li>• Magnitude/distance application (Debi)</li> <li>• Tanya Atwater animations (Rob M)</li> <li>• Real-time seismic information (Debi)</li> <li>• How/Where to find other Web-based information (Ilene)</li> <li>• Hands on - try it yourself to see if you like it!</li> </ul> </li> </ul>
12:30-1:30pm	Catered lunch on the Ocean-view veranda
1:30-1:45pm	Walk to Birch Aquarium at Scripps (BAS)
1:45-3pm	Activities Set II (Held at BAS) <ul style="list-style-type: none"> <li>● Introduction to BAS &amp; the exhibit (Maria Simpson, BAS)</li> <li>● Slinky Waves using BAS exhibit (Bob)</li> <li>● Human Waves in BAS classroom (Ilene)</li> <li>● Free time to explore the BAS exhibit</li> </ul>
3-3:15pm	Walk back to the VizCenter
3:15-4:15pm	Activities Set III (Held at the SIO Visualization Center) <ul style="list-style-type: none"> <li>● Finish activities from Set I if needed</li> <li>● Tsunami (Debi)</li> <li>● Shake table demo (Wendy)</li> </ul>
4:15-4:30pm	Summary (Bob)
4:30-5pm	Workshop wrap-up <ul style="list-style-type: none"> <li>● Complete evaluation form</li> <li>● Certificate awards ceremony</li> <li>● Individual &amp; group digital photo-ops</li> </ul>
5pm	Adjourn



USGS



IRIS

USC/SC



SOSO



OUTLINE