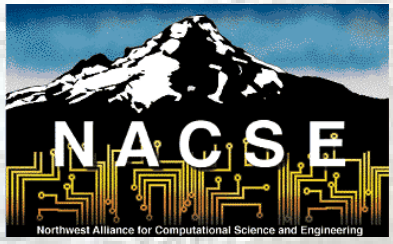
Facilitating Access to Tsunami Materials and Models

Cherri M. Pancake
pancake@nacse.org
October, 2004



Arctic Region Supercomputing Center

International Tsunami Information Center

1: Int'l Tsunami Digital Library

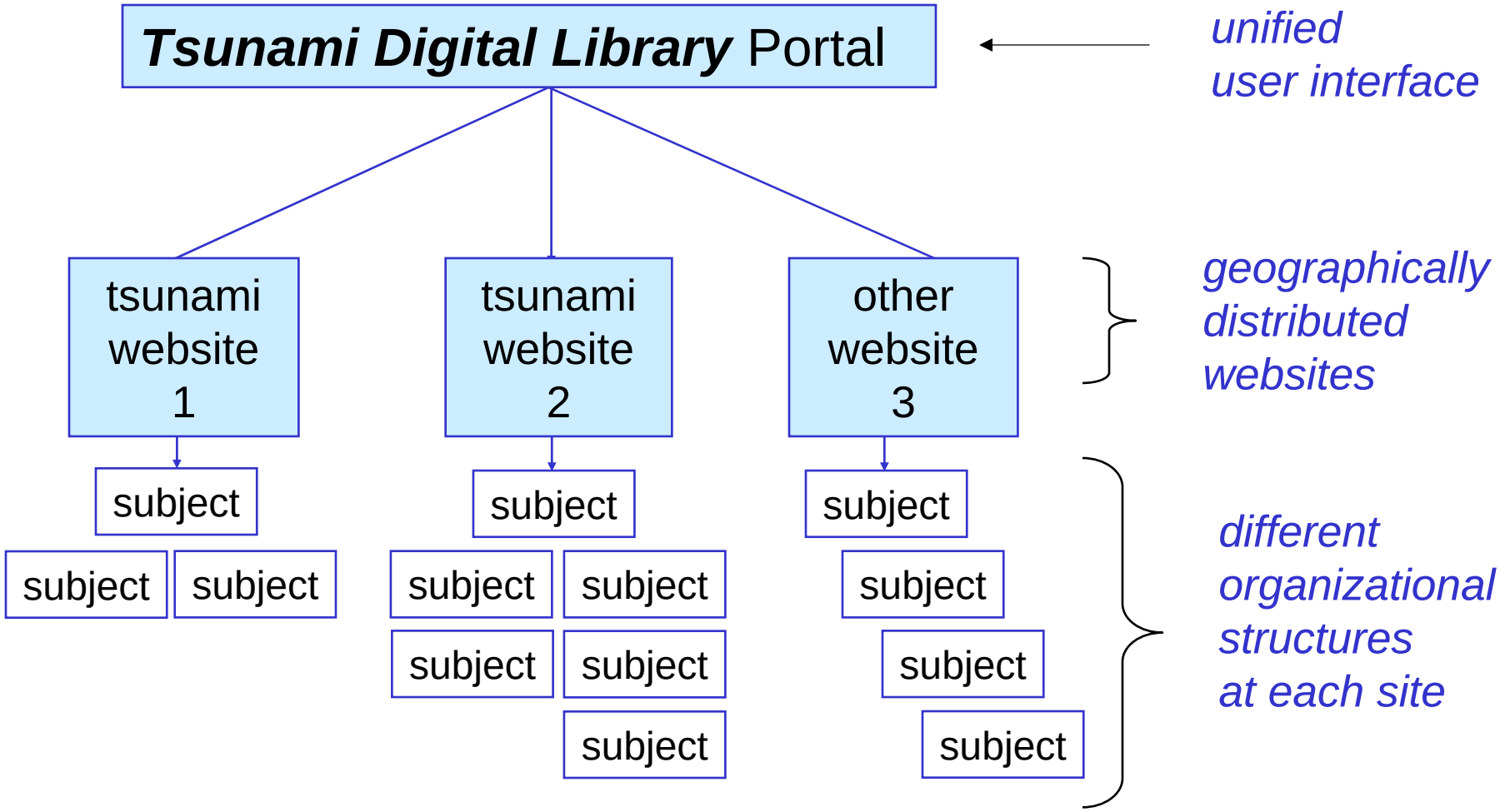
- **Web-based tsunami info is abundant, <u>but</u>**
  - **Information is stored at distributed sites**
  - **Each has different look-and-feel**
  - **Each has unique organization and navigation**
  - **Each targets different issues for exposure**

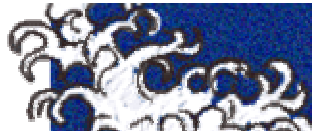
- **Users spend unnecessary time and effort looking for what they need**
  - **Hard for search engines to find them**
  - **Difficult for users to retrace their steps later**

Enter the Tsunami Digital Library...

- Tsunami info environment targeted at non-researchers
- Applies unified look-and-feel to distributed, independent documentation sources
- Applies “intelligence” to parsing, search, and retrieval capabilities
- “Personalizes” access by adapting to each user’s patterns

Architecture of the TDL

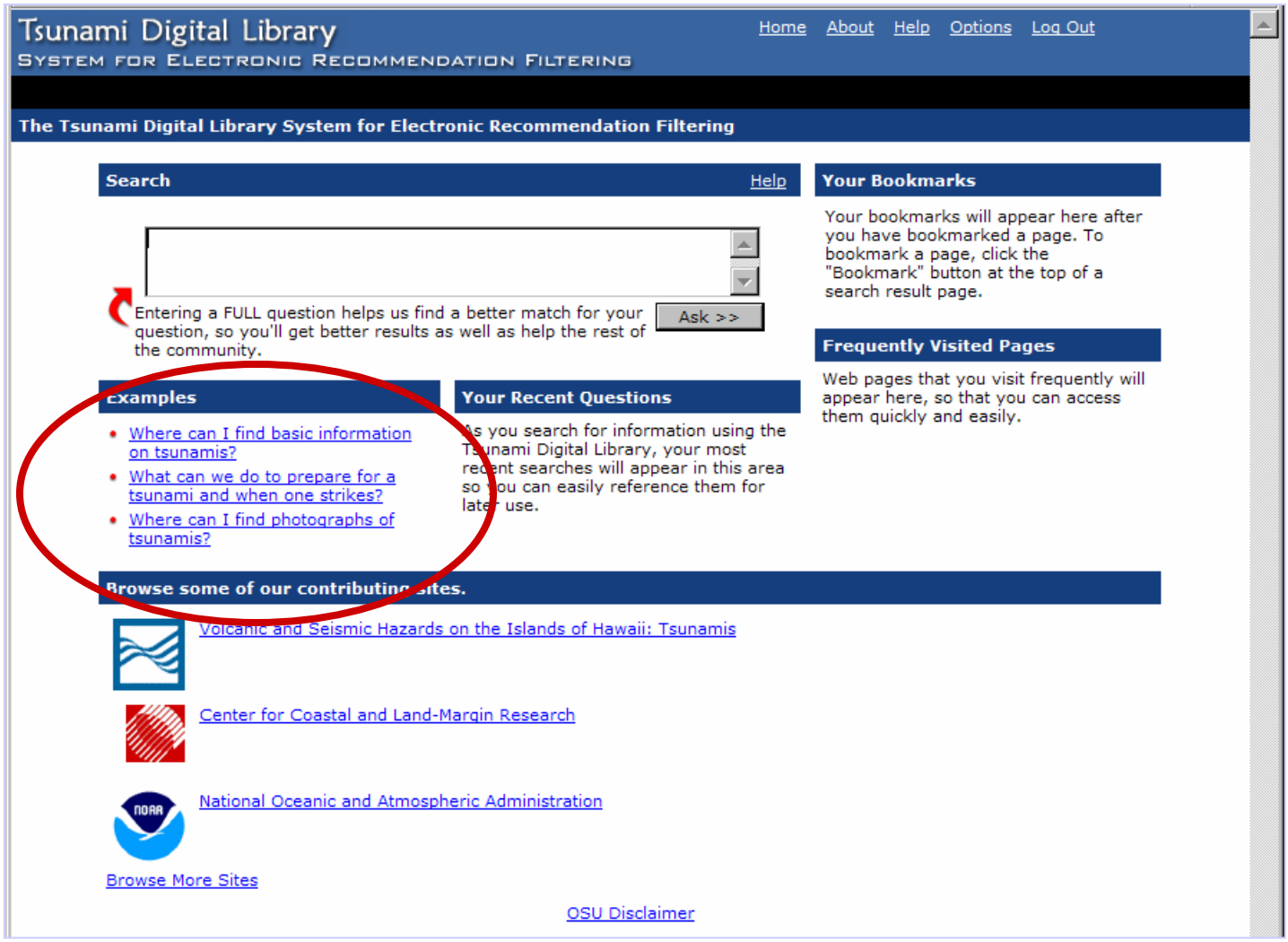




Not Just a New Website

- **TDL Portal unifies access to distributed documents, data, and images**
  - **Fetches web documents on demand (not a static site)**
  - **Clearly identifies sources of information**
  - **Superimposes uniform look-and-feel (not traditional framing)**
  - **Automatically rewrites links to route them through portal**

How It Works


Tsunami Digital Library
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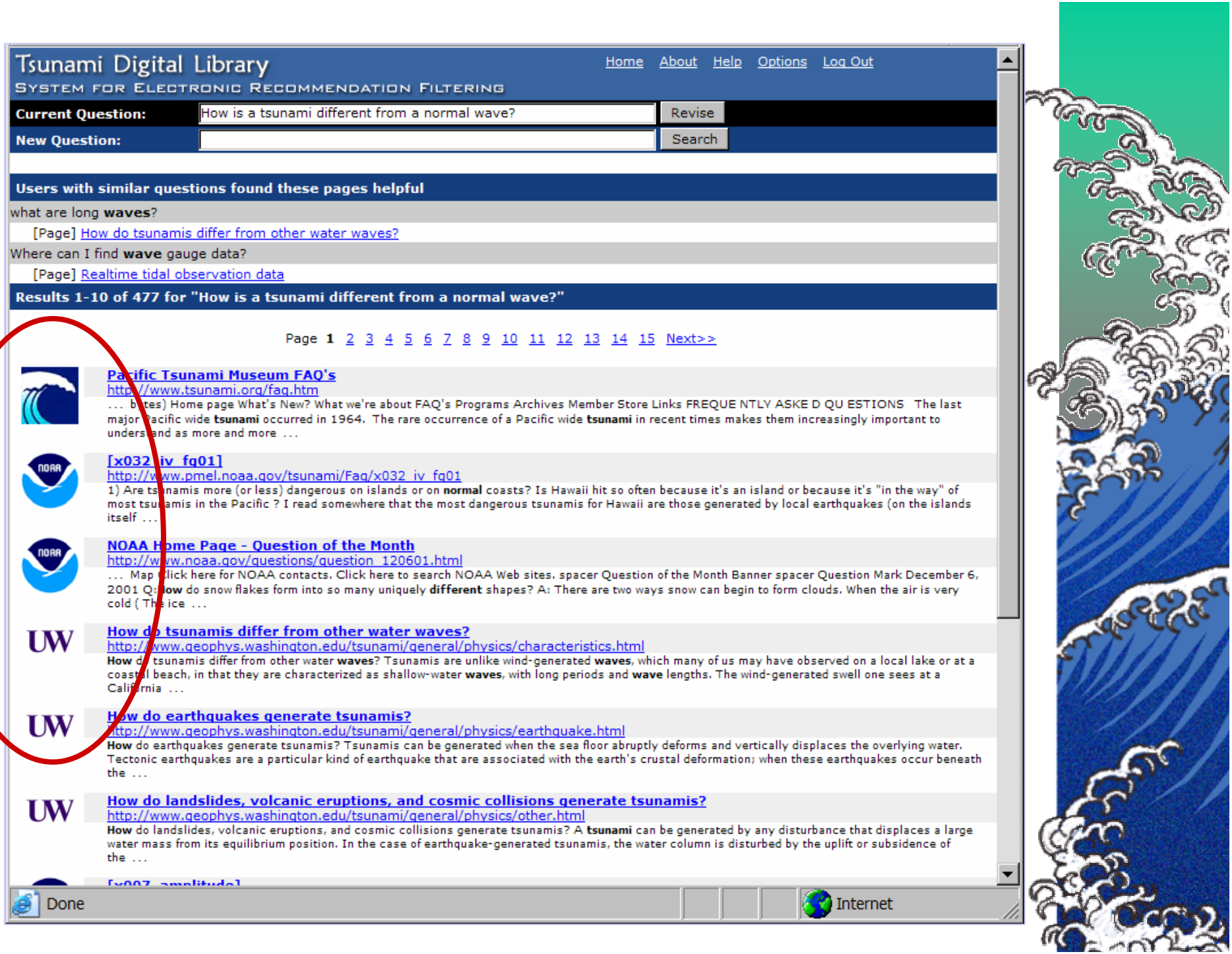
Home About Help Options Log Out
The Tsunami Digital Library System for Electronic Recommendation Filtering
Search
Help
Entering a FULL question helps us find a better match for your question, so you'll get better results as well as help the rest of the community.
Ask >>
Your Bookmarks
Your bookmarks will appear here after you have bookmarked a page. To bookmark a page, click the "Bookmark" button at the top of a search result page.
Frequently Visited Pages
Web pages that you visit frequently will appear here, so that you can access them quickly and easily.
Examples
Where can I find basic information on tsunamis?
What can we do to prepare for a tsunami and when one strikes?
Where can I find photographs of tsunamis?
Your Recent Questions
As you search for information using the Tsunami Digital Library, your most recent searches will appear in this area so you can easily reference them for later use.
Browse some of our contributing sites.
Volcanic and Seismic Hazards on the Islands of Hawaii: Tsunamis
Center for Coastal and Land-Margin Research
National Oceanic and Atmospheric Administration
Browse More Sites
OSU Disclaimer



Tsunami Digital Library
SYSTEM FOR ELECTRONIC RECOMMENDATION FILTERING
Home About Help Options Log Out
Current Question: How is a tsunami different from a normal wave? Revise
New Question: Search
Users with similar questions found these pages helpful
what are long waves?
[Page] How do tsunamis differ from other water waves?
Where can I find wave gauge data?
[Page] Realtime tidal observation data
Results 1-10 of 477 for "How is a tsunami different from a normal wave?"
Page 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Next>>
Pacific Tsunami Museum FAQ's
http://www.tsunami.org/faq.htm
... bytes) Home page What's New? What we're about FAQ's Programs Archives Member Store Links FREQUE NTLY ASKE D QU ESTIONS The last major Pacific wide tsunami occurred in 1964. The rare occurrence of a Pacific wide tsunami in recent times makes them increasingly important to understand as more and more ...
[x032_iv_fq01]
http://www.pmel.noaa.gov/tsunami/Faq/x032_iv_fq01
1) Are tsunamis more (or less) dangerous on islands or on normal coasts? Is Hawaii hit so often because it's an island or because it's "in the way" of most tsunamis in the Pacific ? I read somewhere that the most dangerous tsunamis for Hawaii are those generated by local earthquakes (on the islands itself ...
NOAA Home Page - Question of the Month
http://www.noaa.gov/questions/question_120601.html
... Map Click here for NOAA contacts. Click here to search NOAA Web sites. spacer Question of the Month Banner spacer Question Mark December 6, 2001 Q: How do snow flakes form into so many uniquely different shapes? A: There are two ways snow can begin to form clouds. When the air is very cold (The ice ...
How do tsunamis differ from other water waves?
http://www.geophys.washington.edu/tsunami/general/physics/characteristics.html
How do tsunamis differ from other water waves? Tsunamis are unlike wind-generated waves, which many of us may have observed on a local lake or at a coastal beach, in that they are characterized as shallow-water waves, with long periods and wave lengths. The wind-generated swell one sees at a California ...
How do earthquakes generate tsunamis?
http://www.geophys.washington.edu/tsunami/general/physics/earthquake.html
How do earthquakes generate tsunamis? Tsunamis can be generated when the sea floor abruptly deforms and vertically displaces the overlying water. Tectonic earthquakes are a particular kind of earthquake that are associated with the earth's crustal deformation; when these earthquakes occur beneath the ...
How do landslides, volcanic eruptions, and cosmic collisions generate tsunamis?
http://www.geophys.washington.edu/tsunami/general/physics/other.html
How do landslides, volcanic eruptions, and cosmic collisions generate tsunamis? A tsunami can be generated by any disturbance that displaces a large water mass from its equilibrium position. In the case of earthquake-generated tsunamis, the water column is disturbed by the uplift or subsidence of the ...
[x007_amplitude]
Done
Internet

Tsunami Digital Library
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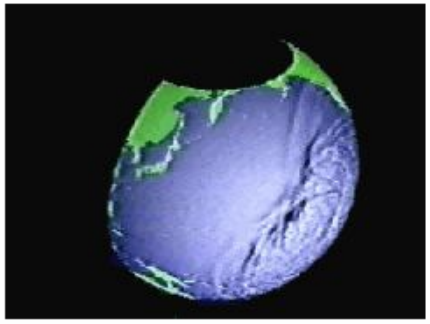
Original Question: **HOW IS A TSUNAMI DIFFERENT FROM A NORMAL WAVE?**
Ask New Question Ask A Librarian

Did this Answer , Help Answer , Somewhat Answer , or Not Answer your question?

How do tsunamis differ from other water waves?

Tsunamis are unlike wind-generated waves, which many of us may have observed on a local lake or at a coastal beach, in that they are characterized as shallow-water waves, with long periods and wave lengths. The wind-generated swell one sees at a California beach, for example, spawned by a storm out in the Pacific and rhythmically rolling in, one wave after another, might have a period of about 10 seconds and a wave length of 150 m. A tsunami, on the other hand, can have a wavelength in excess of 100 km and period on the order of one hour.

As a result of their long wave lengths, tsunamis behave as shallow-water waves. A wave becomes a shallow-water wave when the ratio between the water depth and its wave length gets very small. Shallow-water waves move at a speed that is equal to the square root of the product of the acceleration of gravity (9.8 m/s/s) and the water depth - let's see what this implies: In the Pacific Ocean, where the typical water depth is about 4000 m, a tsunami travels at about 200 m/s, or over 700 km/hr. Because the rate at which a wave loses its energy is inversely related to its wave length, tsunamis not only propagate at high speeds, they can also travel great, transoceanic distances with limited energy losses.



This animation (2.3 MB), produced by Professor Nobuo Shuto of the Disaster Control Research Center, Tohoku University, Japan, shows the propagation of the earthquake-generated 1960 Chilean tsunami across the Pacific. Note the vastness of the area across which the tsunami travels - Japan, which is over 17,000 km away from the tsunami's source off the coast of Chile, lost 200 lives to this tsunami. Also note how the wave crests bend as the tsunami travels - this is called refraction. Wave refraction is caused by segments of the wave moving at different speeds as the water depth along the crest varies. *Please note that the vertical scale has been exaggerated in this animation - tsunamis are only about a meter high at the most in the open*

Internet

Not Just Web Links

- TDL adds “intelligence” to search and index operations
- Automatically indexes all documents at participating sites
- State-of-the-art technology for ranking document relevance
  - Frequency of key terms (like standard search engines)
  - Frequency of citation (like Google)


Tsunami Digital Library
Home About Help Options Log Out
System for Electronic Recommendation Filtering
Current Question:
Can I simulate a tsunami
Revise
New Question:
Search
This seems to be a new question.
This appears to be a new question. Voting for a document found below will help the system "remember" the question and provide recommendations based on your feedback. Thank you for contributing to the growth of the Tsunami Digital Library!
Results 1-10 of 415 for "Can I simulate a tsunami"
Page 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Next>>
East Java Tsunami Simulation
http://www.geophys.washington.edu/tsunami/specialized/events/eastjava/animation.html
East Java Tsunami Simulation This simulation (7.7 MB) of the 1994 East Java tsunami was developed by Nobuya Horiuchi of the Disaster Control Research Center, Tohoku University, Japan. It shows the initial water-surface profile over the source area and the subsequent wave propagation away from the source ...
Pacific Tsunami Museum FAQ's
http://www.tsunami.org/faq.htm
... bytes) Home page What's New? What we're about FAQ's Programs Archives Member Store Links FREQUE NTLY ASKE D QU ESTIONS The last major Pacific wide tsunami occurred in 1964. The rare occurrence of a Pacific wide tsunami in recent times makes them increasingly important to understand as more and more ...
[x011_homemade_tsunami]
http://www.pmel.noaa.gov/tsunami/Faq/x011_homemade_tsunami
Subject: How can we make a homemade simulation of a tsunami? Dr. Hal Mofjeld, mofjeld@pmel.noaa.gov: Here's an idea that's very similar to laboratory models that are often used ...
Goals
http://www.pmel.noaa.gov/tsunami/Iugg99/iugg99_p1.html
Goals • Understand how oceanic topography affects tsunami wave propagation •   Develop simple criteria for identifying topography that reflects and scatters •   Interpret the tsunami wave-height patterns seen in model simulations •   Determine how smoothing the topography ...
Tsunami Wave Scattering In The North Pacific
http://www.pmel.noaa.gov/tsunami/Iugg99/iugg99_abstract.html
TSUNAMI WAVE SCATTERING IN THE NORTH PACIFIC H.O. Mofjeld, V.V. Titov, F.I. González and J.C. Newman NOAA/Pacific Marine Environmental Laboratory Seattle, WA, USA A theoretical study is being carried out to understand how escarpments, ridges and seamounts affect deep-water tsunami propagation in the ...
Summary
http://www.pmel.noaa.gov/tsunami/Ws20010123/
S u m m a r y Puget Sound Tsunami/Landslide Workshop January 23 and 24, 2001 Organizers George Crawford Washington State Military Department Emergency Management Division Hal Mofjeld National Oceanographic and Atmospheric Administration Craig Weaver United States Geological Survey Sponsored by ...
CCALMR PROJECTS
http://www.ccalmr.ogi.edu/projects/oregonian/
... laws of physics, and information from prehistoric earthquakes and tsunamis in a fairly unique way. One of the outcomes are computer models that simulate the propagation of CSZ tsunamis. These models provide insight into what happened in the past and what might happen in the future, should a
Internet

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Original Question: CAN I SIMULATE A TSUNAMI
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Did this Answer , Help Answer , Somewhat Answer , or Not Answer your question?

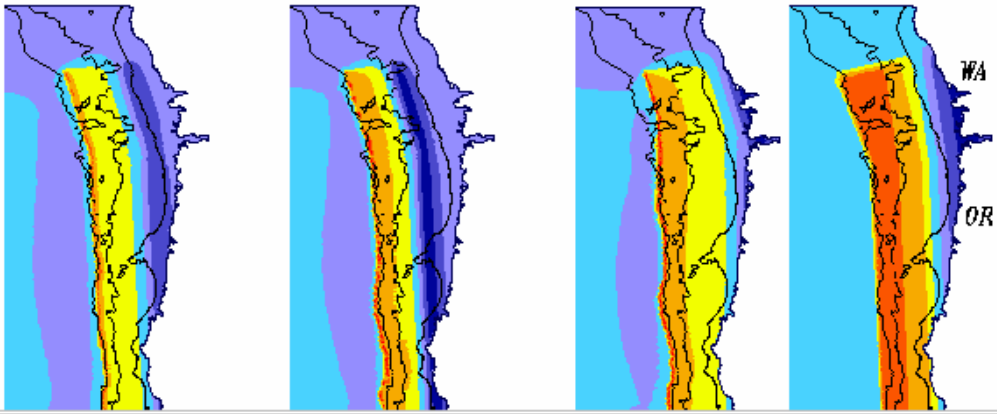
Science for Society:

Impact of tsunamis on Oregon coastal communities

Documents, plus …

Scenarios of Sea Floor Deformation

The uncertainties regarding the definition of CSZ sea floor deformations led us to investigate several alternative scenarios of deformation. The figures below illustrate four major such scenarios. Each figure shows isolines of predicted uplift and subsidence from hypothetical subduction zone earthquakes. Redish colors indicate uplift, and blueish colors indicate subsidence. The darker the color, the larger the sea floor deformation.



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Original Question: **CAN I SIMULATE A TSUNAMI**

Ask New Question Ask A Librarian

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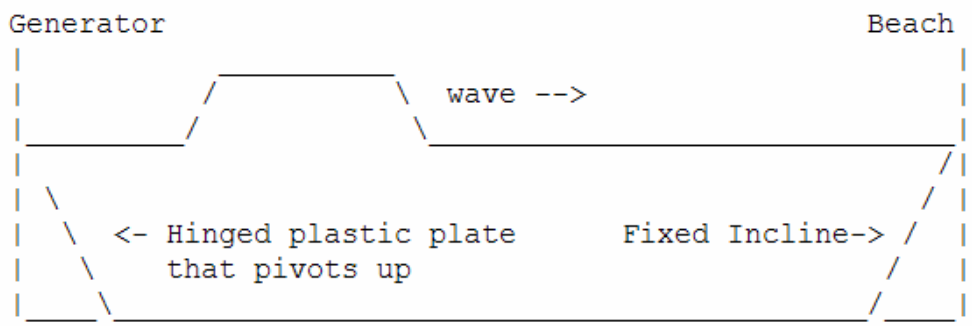
Subject: How can we make a homemade simulation of a tsunami?

Dr. Hal Mofjeld, mofjeld@pmel.noaa.gov:

Here's an idea that's very similar to laboratory models that are often used to study tsunamis.

Water Tank or Trough (a couple of feet long)
Not to scale



The Generating Plate simulates the upward motion of the earth, creating a "bump" in the water. The resulting wave propagating away toward the beach, or impact area. The wave builds in height as the water gets shallower toward the beach (due the the Fixed Incline) and hits the shore. This will probably work best if the the Generating Plate is about a foot long and the water is relatively shallow. It can be moved up rapidly using a strong string attached

Done Internet

Reports and notes

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Original Question: **WHERE CAN I FIND PHOTOGRAPHS OF TSUNAMIS?**
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The Hilo Bay Waterfront after the 1946 tsunami. The railroad is replaced today by the Bayfront Highway.

Photo: Pacific Tsunami Museum Archives- Hatada Collection

An Army Crash boat, which was at the wharf, washed up for about 400 feet, over the railroad tracks, and up against these molasses tanks.

Internet

Images

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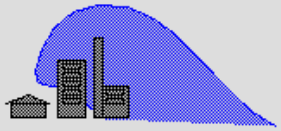
Original Question: CAN I SIMULATE A TSUNAMI
Ask New Question Ask A Librarian

Did this Answer , Help Answer , Somewhat Answer , or Not Answer your question?

Center for Coastal & Land-Margin Research

Science for Society:



Impact of tsunamis on Oregon coastal communities

Animations/video

List of Animations

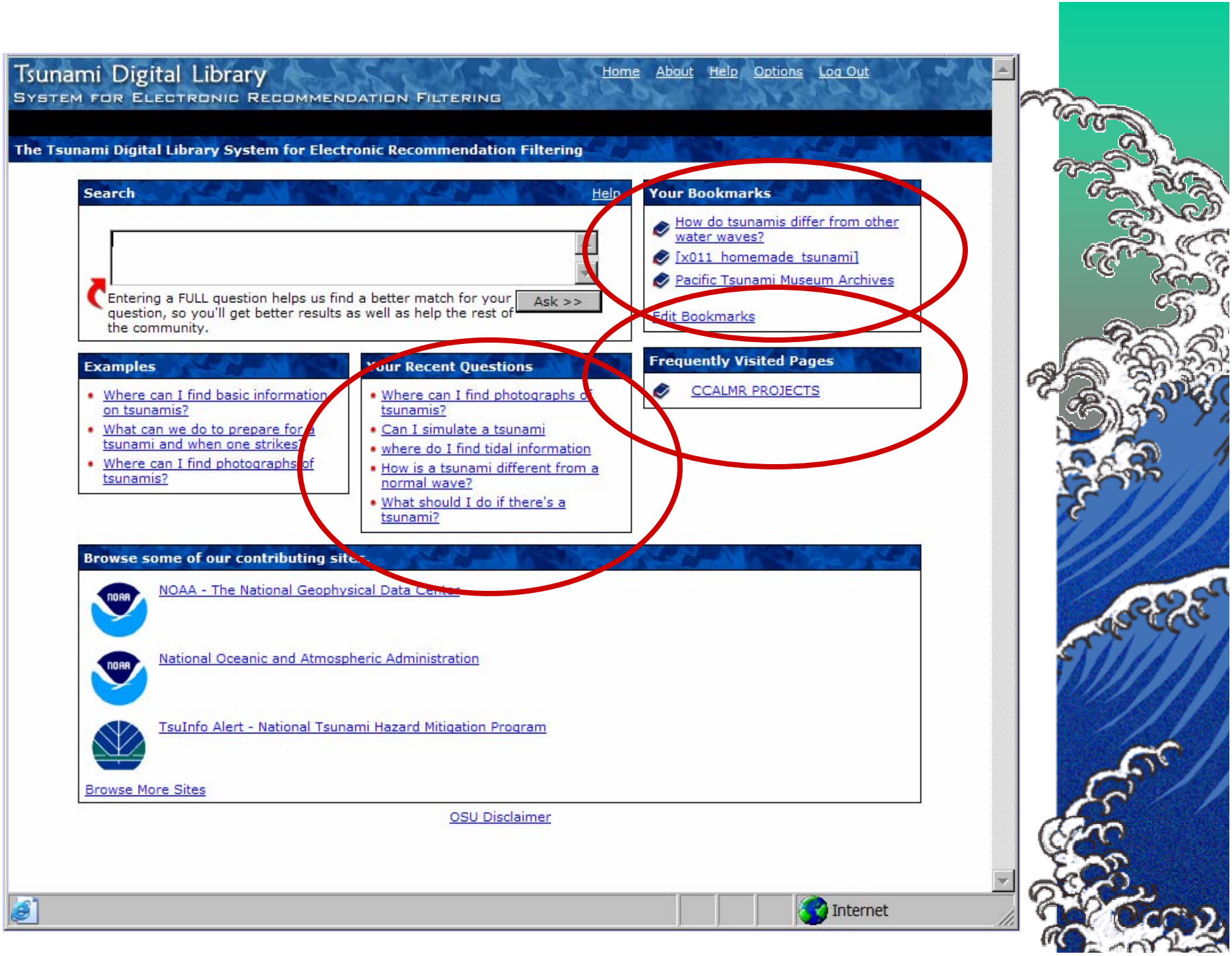
QT	FLC	Animation
☒	☒	**Pacific Northwest Coast**
☒	☒	**Northern Oregon and southern Washington, including Seaside and Long Beach**
☒	☒	**Central Oregon, including Yaquina Bay and Alsea Bay**
☒	☒	**Southern Oregon and northern California, including Brookings and Crescent City**

*All animations refer to the propagation of Cascadia Subduction Zone tsunamis, for Scenario 4. Animations are available in both **flc** and **QuickTime (QT)** format. MAC and PC users may prefer **QT**, while UNIX users may prefer **flc**.*

Internet

Personalized Delivery

- Adjusts interface to user's preferences and needs
  - System stores personal "favorites"
  - Also keeps most-frequently-visited pages handy
  - History mechanism makes it easy to repeat / resume / modify past queries


Tsunami Digital Library
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The Tsunami Digital Library System for Electronic Recommendation Filtering
Search
Help
Entering a FULL question helps us find a better match for your question, so you'll get better results as well as help the rest of the community.
Ask >>
Your Bookmarks
How do tsunamis differ from other water waves?
[x011_homemade_tsunami]
Pacific Tsunami Museum Archives
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Examples
Where can I find basic information on tsunamis?
What can we do to prepare for a tsunami and when one strikes?
Where can I find photographs of tsunamis?
Your Recent Questions
Where can I find photographs of tsunamis?
Can I simulate a tsunami
where do I find tidal information
How is a tsunami different from a normal wave?
What should I do if there's a tsunami?
Frequently Visited Pages
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NOAA - The National Geophysical Data Center
National Oceanic and Atmospheric Administration
TsuInfo Alert - National Tsunami Hazard Mitigation Program
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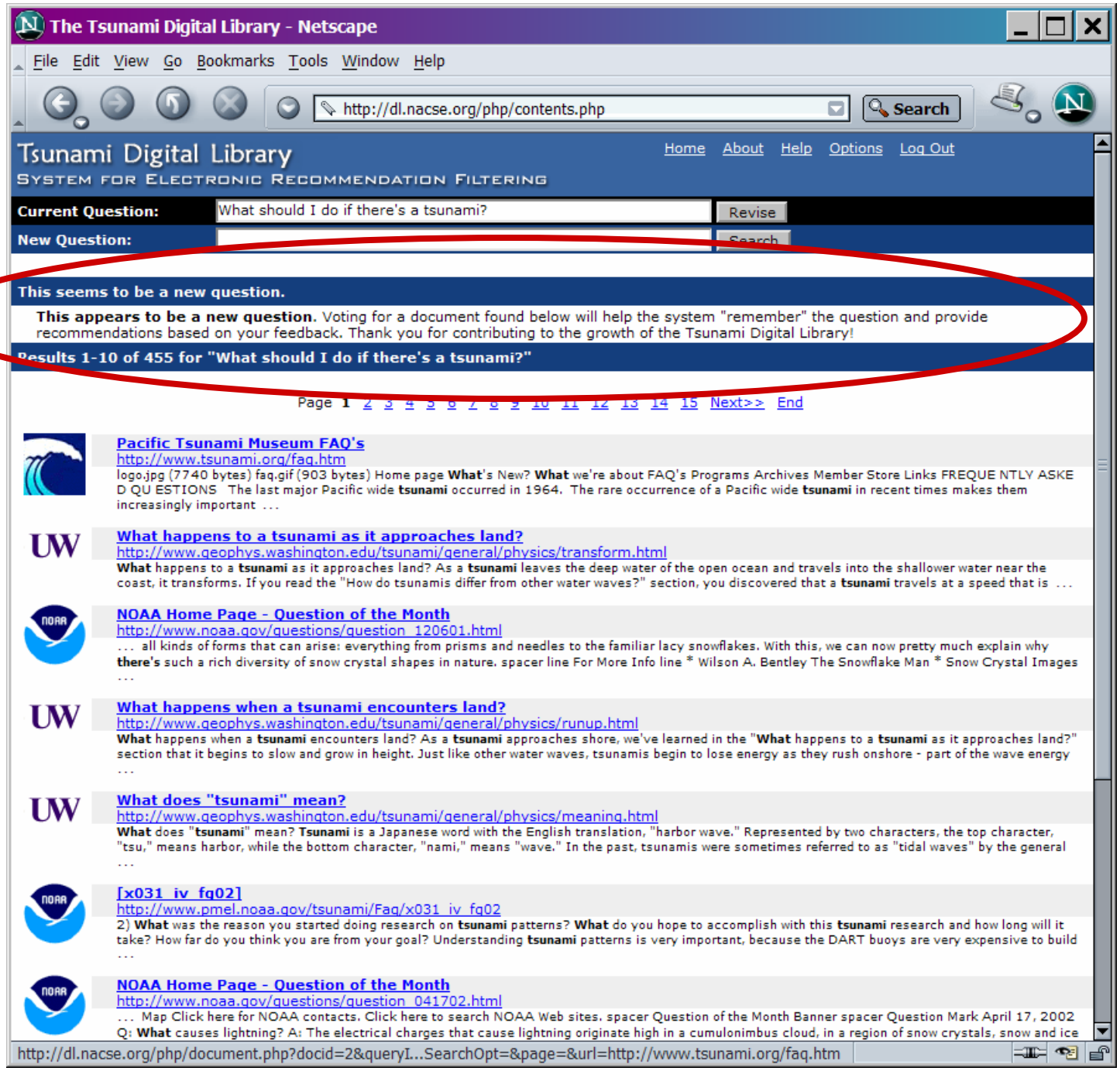
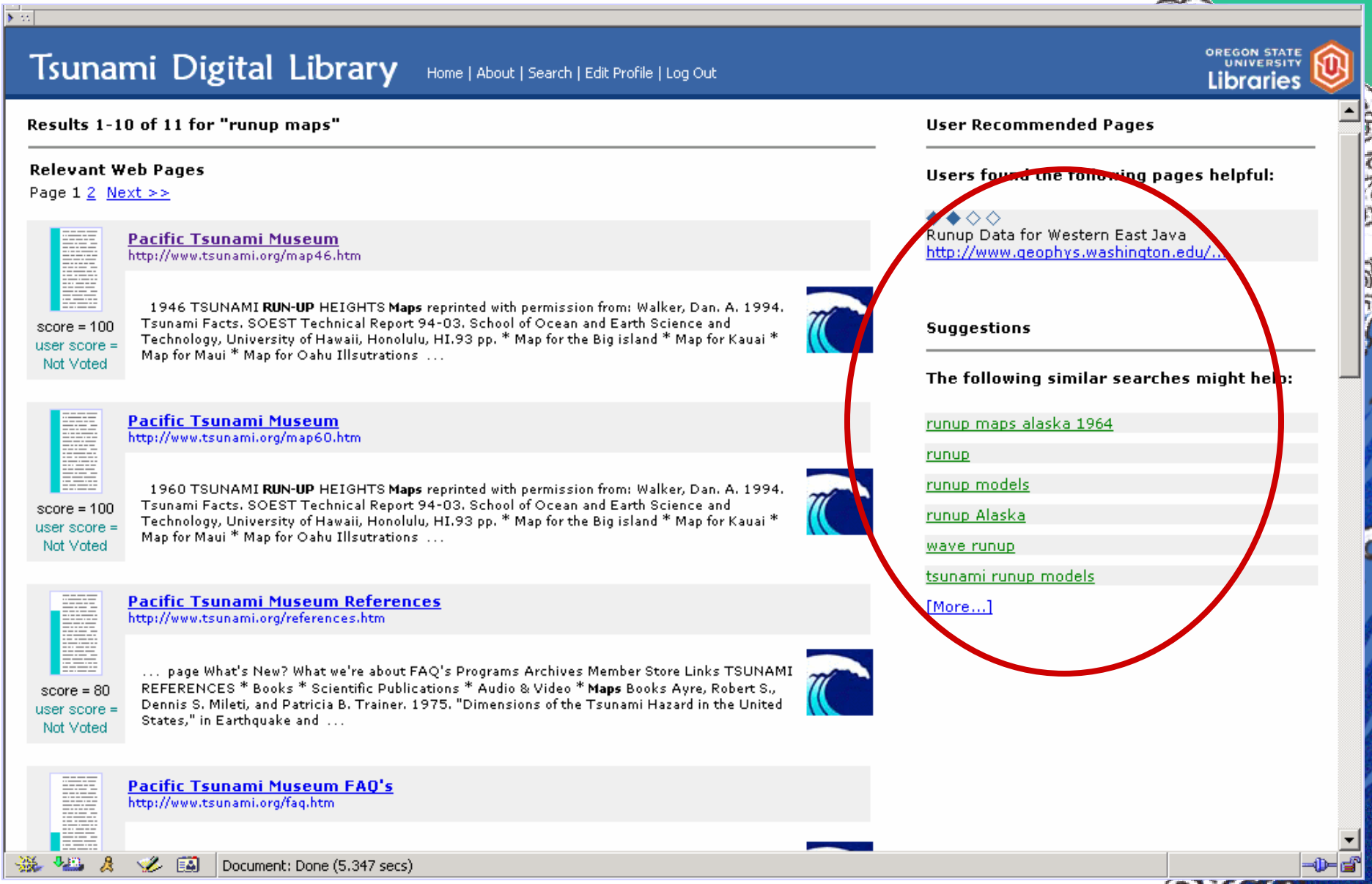
Incorporating User Feedback

- **Allows each user to benefit from past users' experiences**
  - **Exposes similar questions that others have asked**
  - **Gathers user input about which pages are most useful in answering each question**


The Tsunami Digital Library - Netscape
File Edit View Go Bookmarks Tools Window Help
http://dl.nacse.org/php/contents.php
Search
Tsunami Digital Library
System for Electronic Recommendation Filtering
Home About Help Options Log Out
Current Question:
What should I do if there's a tsunami?
Revise
New Question:
Search
This seems to be a new question.
This appears to be a new question. Voting for a document found below will help the system "remember" the question and provide recommendations based on your feedback. Thank you for contributing to the growth of the Tsunami Digital Library!
Results 1-10 of 455 for "What should I do if there's a tsunami?"
Page 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Next>> End
Pacific Tsunami Museum FAQ's
http://www.tsunami.org/faq.htm
logo.jpg (7740 bytes) faq.gif (903 bytes) Home page What's New? What we're about FAQ's Programs Archives Member Store Links FREQUE NTLY ASKE D QU ESTIONS The last major Pacific wide tsunami occurred in 1964. The rare occurrence of a Pacific wide tsunami in recent times makes them increasingly important ...
What happens to a tsunami as it approaches land?
http://www.geophys.washington.edu/tsunami/general/physics/transform.html
What happens to a tsunami as it approaches land? As a tsunami leaves the deep water of the open ocean and travels into the shallower water near the coast, it transforms. If you read the "How do tsunamis differ from other water waves?" section, you discovered that a tsunami travels at a speed that is ...
NOAA Home Page - Question of the Month
http://www.noaa.gov/questions/question_120601.html
... all kinds of forms that can arise: everything from prisms and needles to the familiar lacy snowflakes. With this, we can now pretty much explain why there's such a rich diversity of snow crystal shapes in nature. spacer line For More Info line * Wilson A. Bentley The Snowflake Man * Snow Crystal Images ...
What happens when a tsunami encounters land?
http://www.geophys.washington.edu/tsunami/general/physics/runup.html
What happens when a tsunami encounters land? As a tsunami approaches shore, we've learned in the "What happens to a tsunami as it approaches land?" section that it begins to slow and grow in height. Just like other water waves, tsunamis begin to lose energy as they rush onshore - part of the wave energy ...
What does "tsunami" mean?
http://www.geophys.washington.edu/tsunami/general/physics/meaning.html
What does "tsunami" mean? Tsunami is a Japanese word with the English translation, "harbor wave." Represented by two characters, the top character, "tsu," means harbor, while the bottom character, "nami," means "wave." In the past, tsunamis were sometimes referred to as "tidal waves" by the general ...
[x031_iv_fq02]
http://www.pmel.noaa.gov/tsunami/Faq/x031_iv_fq02
2) What was the reason you started doing research on tsunami patterns? What do you hope to accomplish with this tsunami research and how long will it take? How far do you think you are from your goal? Understanding tsunami patterns is very important, because the DART buoys are very expensive to build ...
NOAA Home Page - Question of the Month
http://www.noaa.gov/questions/question_041702.html
... Map Click here for NOAA contacts. Click here to search NOAA Web sites. spacer Question of the Month Banner spacer Question Mark April 17, 2002 Q: What causes lightning? A: The electrical charges that cause lightning originate high in a cumulonimbus cloud, in a region of snow crystals, snow and ice
http://dl.nacse.org/php/document.php?docid=2&queryI...SearchOpt=&page=&url=http://www.tsunami.org/faq.htm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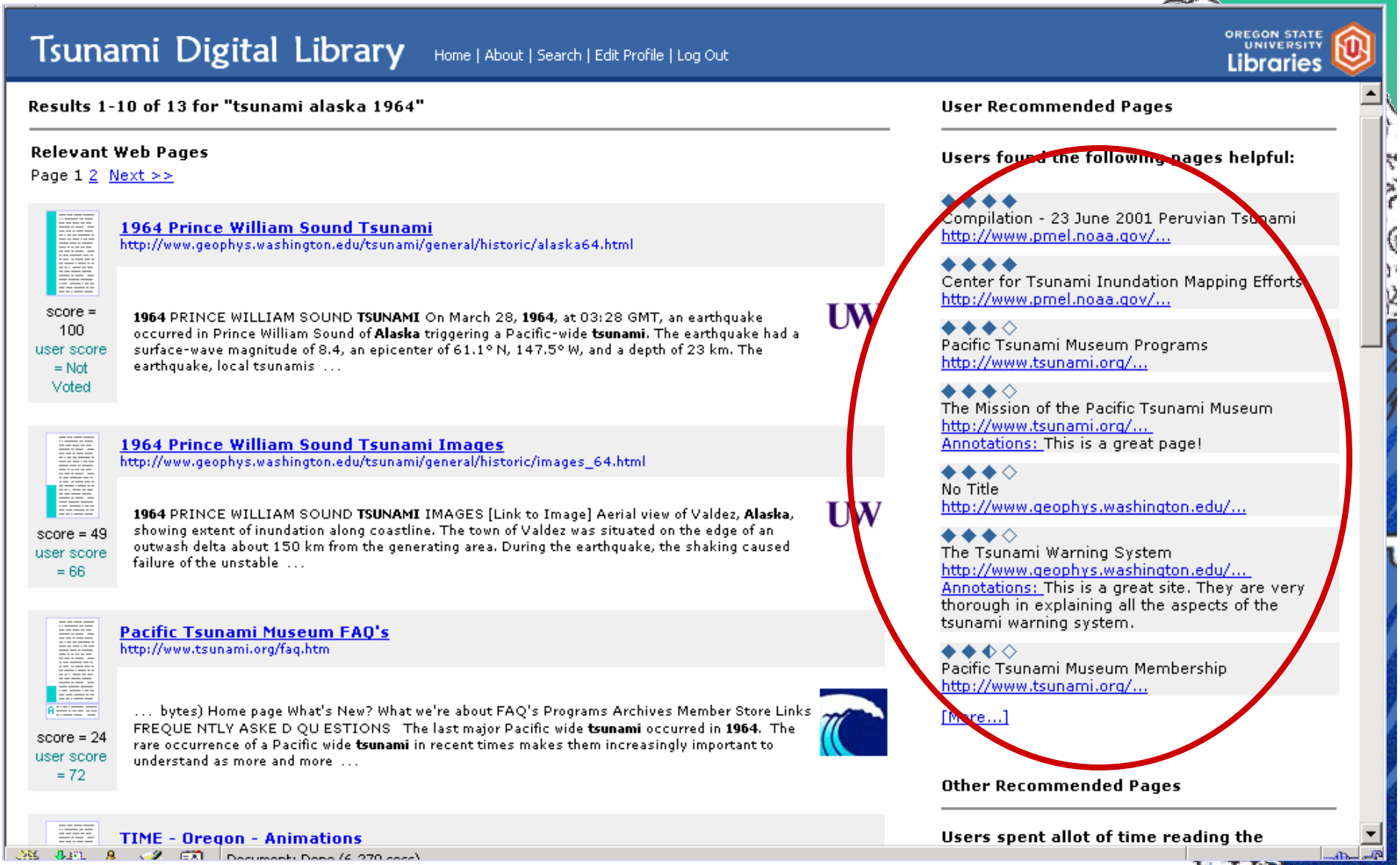
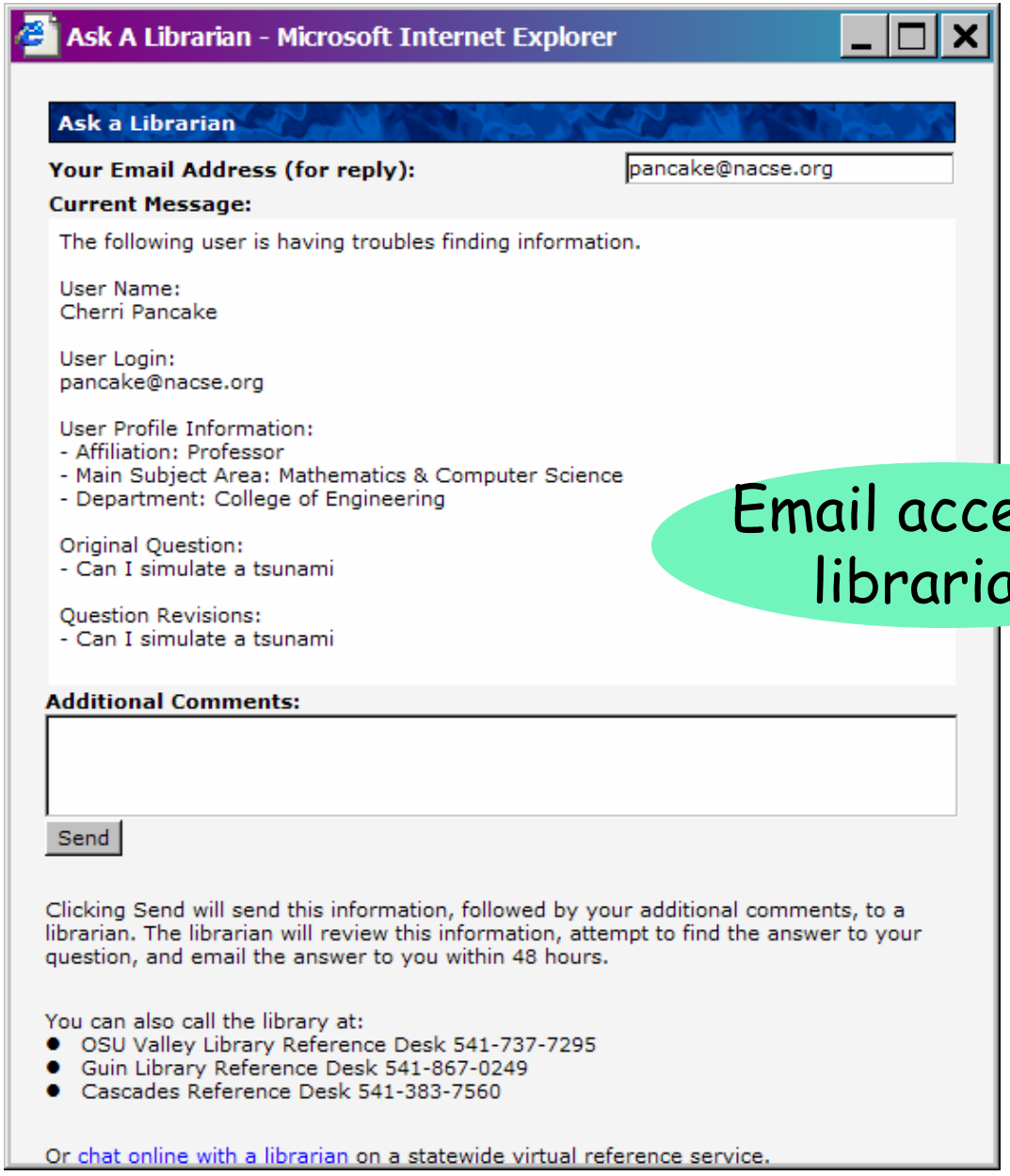
Relevant Web Pages
Page 1 2 Next >>
Pacific Tsunami Museum
http://www.tsunami.org/map46.htm
score = 100
user score = Not Voted
1946 TSUNAMI RUN-UP HEIGHTS Maps reprinted with permission from: Walker, Dan. A. 1994. Tsunami Facts. SOEST Technical Report 94-03. School of Ocean and Earth Science and Technology, University of Hawaii, Honolulu, HI.93 pp. * Map for the Big island * Map for Kauai * Map for Maui * Map for Oahu Illsutrations ...
Pacific Tsunami Museum
http://www.tsunami.org/map60.htm
score = 100
user score = Not Voted
1960 TSUNAMI RUN-UP HEIGHTS Maps reprinted with permission from: Walker, Dan. A. 1994. Tsunami Facts. SOEST Technical Report 94-03. School of Ocean and Earth Science and Technology, University of Hawaii, Honolulu, HI.93 pp. * Map for the Big island * Map for Kauai * Map for Maui * Map for Oahu Illsutrations ...
Pacific Tsunami Museum References
http://www.tsunami.org/references.htm
score = 80
user score = Not Voted
... page What's New? What we're about FAQ's Programs Archives Member Store Links TSUNAMI REFERENCES * Books * Scientific Publications * Audio & Video * Maps Books Ayre, Robert S., Dennis S. Mileti, and Patricia B. Trainer. 1975. "Dimensions of the Tsunami Hazard in the United States," in Earthquake and ...
Pacific Tsunami Museum FAQ's
http://www.tsunami.org/faq.htm
User Recommended Pages
Users found the following pages helpful:
Runup Data for Western East Java
http://www.geophys.washington.edu/...
Suggestions
The following similar searches might help:
runup maps alaska 1964
runup
runup models
runup Alaska
wave runup
tsunami runup models
[More...]
Document: Done (5.347 secs)


Tsunami Digital Library
Home | About | Search | Edit Profile | Log Out
OREGON STATE UNIVERSITY Libraries
Results 1-10 of 13 for "tsunami alaska 1964"
Relevant Web Pages
Page 1 2 Next >>
1964 Prince William Sound Tsunami
http://www.geophys.washington.edu/tsunami/general/historic/alaska64.html
score = 100
user score = Not Voted
1964 PRINCE WILLIAM SOUND TSUNAMI On March 28, 1964, at 03:28 GMT, an earthquake occurred in Prince William Sound of Alaska triggering a Pacific-wide tsunami. The earthquake had a surface-wave magnitude of 8.4, an epicenter of 61.1° N, 147.5° W, and a depth of 23 km. The earthquake, local tsunamis ...
1964 Prince William Sound Tsunami Images
http://www.geophys.washington.edu/tsunami/general/historic/images_64.html
score = 49
user score = 66
1964 PRINCE WILLIAM SOUND TSUNAMI IMAGES [Link to Image] Aerial view of Valdez, Alaska, showing extent of inundation along coastline. The town of Valdez was situated on the edge of an outwash delta about 150 km from the generating area. During the earthquake, the shaking caused failure of the unstable ...
Pacific Tsunami Museum FAQ's
http://www.tsunami.org/faq.htm
score = 24
user score = 72
... bytes) Home page What's New? What we're about FAQ's Programs Archives Member Store Links FREQUE NTLY ASKE D QU ESTIONS The last major Pacific wide tsunami occurred in 1964. The rare occurrence of a Pacific wide tsunami in recent times makes them increasingly important to understand as more and more ...
TIME - Oregon - Animations
User Recommended Pages
Users found the following pages helpful:
Compilation - 23 June 2001 Peruvian Tsunami
http://www.pmel.noaa.gov/...
Center for Tsunami Inundation Mapping Efforts
http://www.pmel.noaa.gov/...
Pacific Tsunami Museum Programs
http://www.tsunami.org/...
The Mission of the Pacific Tsunami Museum
http://www.tsunami.org/...
Annotations: This is a great page!
No Title
http://www.geophys.washington.edu/...
The Tsunami Warning System
http://www.geophys.washington.edu/...
Annotations: This is a great site. They are very thorough in explaining all the aspects of the tsunami warning system.
Pacific Tsunami Museum Membership
http://www.tsunami.org/...
[More...]
Other Recommended Pages
Users spent allot of time reading the

When In Doubt, Add a Human to the Loop



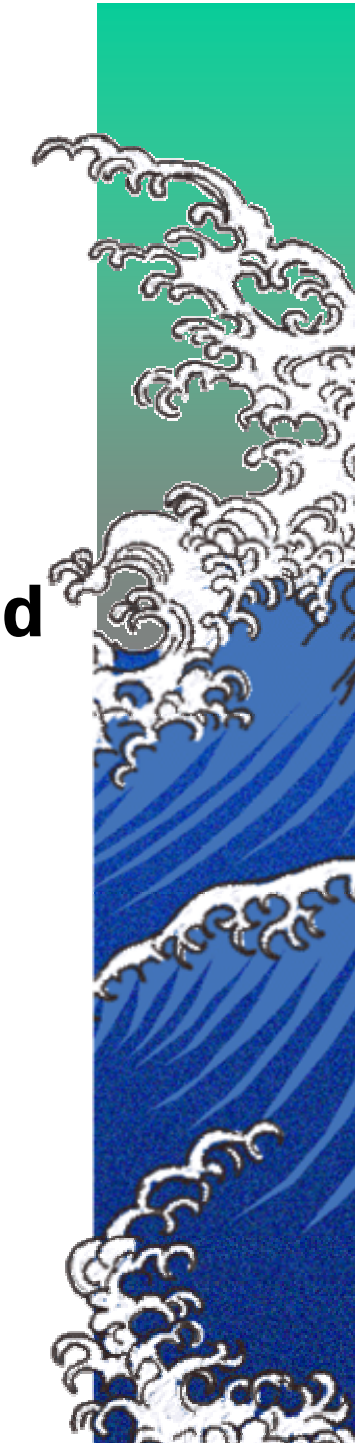
Email access to librarians

Where Things Stand

- Proof-of-concept works
- Underlying mechanisms being enhanced as part of separate digital library effort
  - NSF proposal not funded 
- OrSt and ITIC are looking for partners
  - Identifying & incorporating websites with valuable information
  - Digitizing historical photos/audio
  - Helping us seek funding

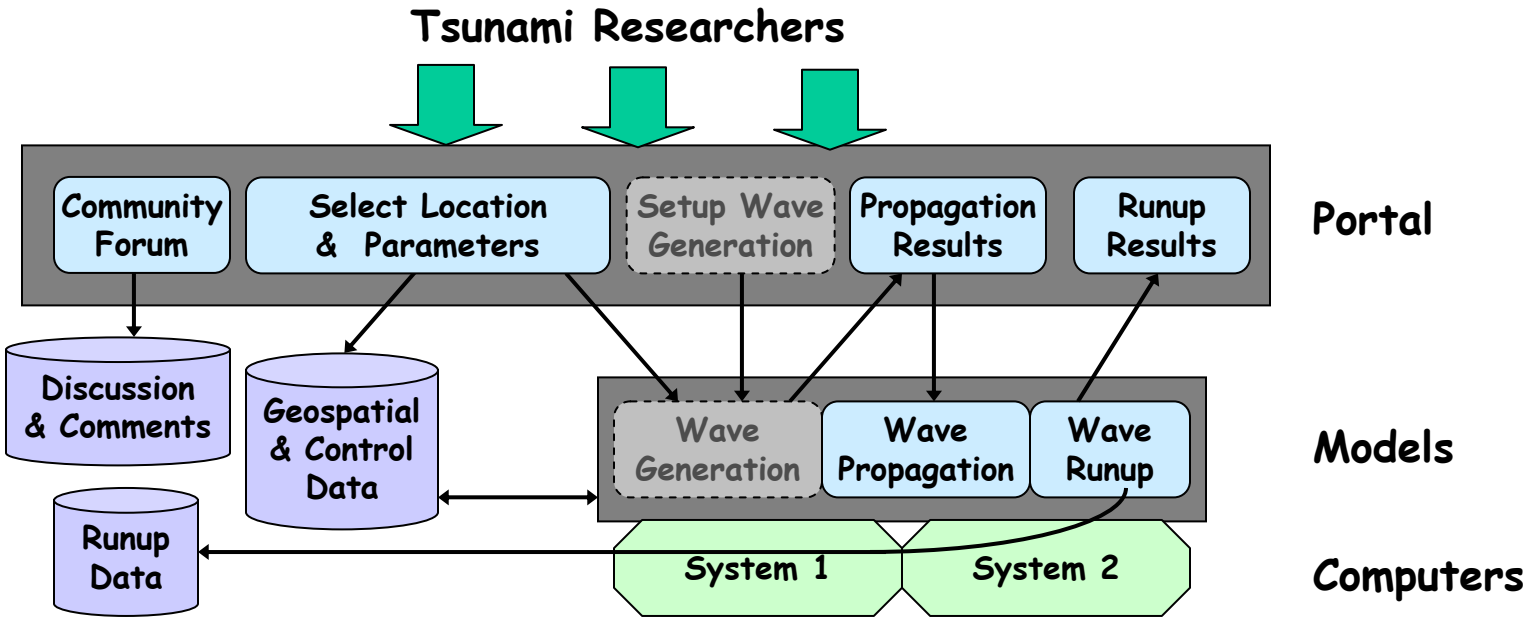
2: Tsunami Computational Portal

- Shared web portal for executing computational model(s) of tsunami behavior
- Shared models maintained and supported by computing professionals
  - Arctic Region Supercomputing Center
- Advantages
  - One-stop access to models
  - Simplifies use of models
  - Streamlines access to input data, results



How It Works

- **Researchers access portal to**
  - **Select conditions for which model will be run**
  - **Specify parameters for model run and submit**
  - **Access or download results**
  - **Share comments on results, issues, recommendations for future enhancements**



Initial Project

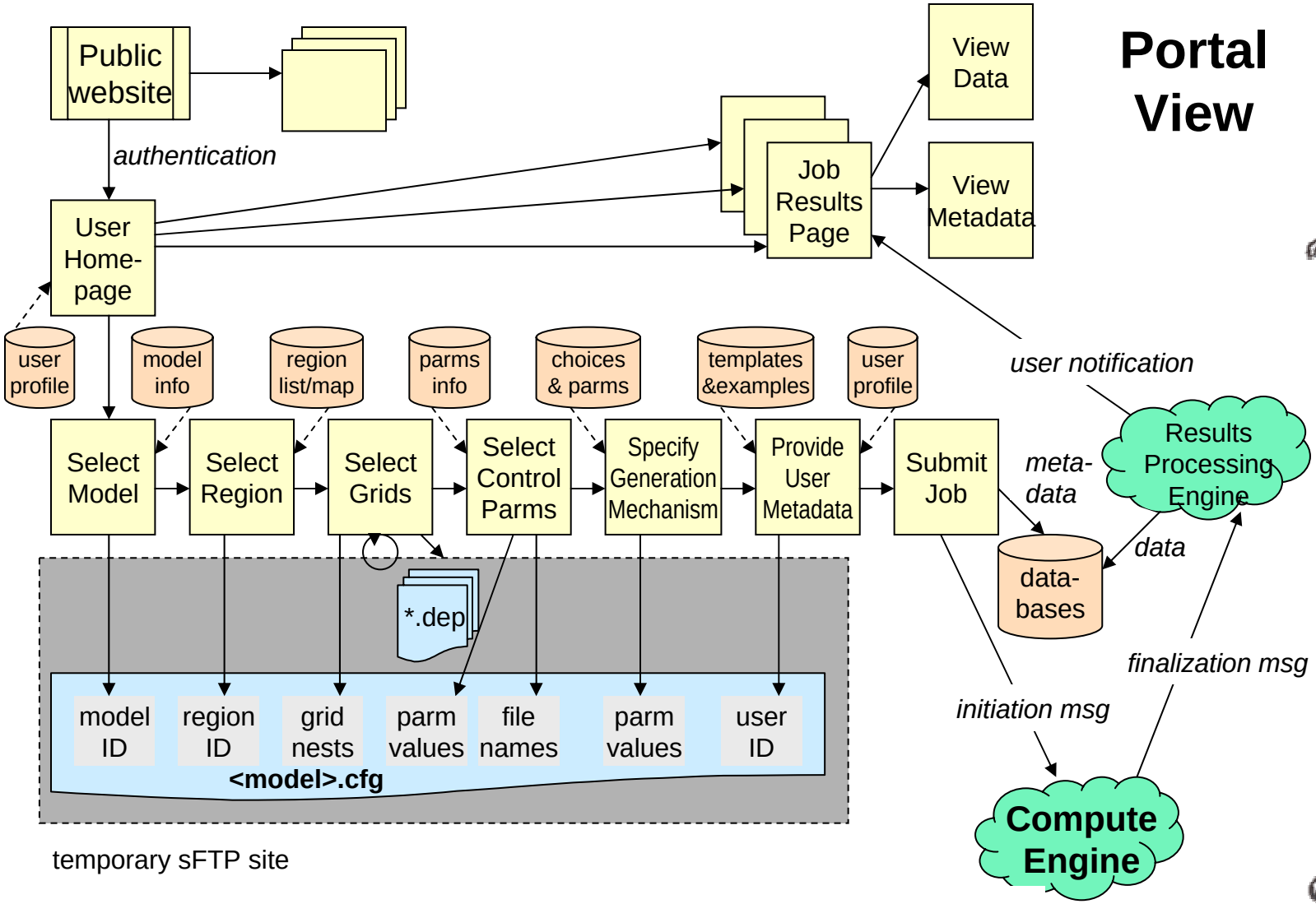
- Currently funded by ARSC and NOAA grant
- Project initiates the portal – other models and capabilities later
- Interdisciplinary, extremely distributed team

Role	*Activities*	*Who*
Modelers	Port models, parametrize them & enhance over time	Cornell UAF/GI
Scenario developers	Define properties of hypothetical communities & other benchmarks	OrSt
Interface designers	Develop appropriate web interfaces, conduct usability tests	NACSE (OrSt)
System program-mers	Port to new systems, set up & manage system accounts, manage data	ARSC

Not as Easy as It Sounds ...

- Individual models have very little in common, e.g.
  - Idiosyncratic ways of specifying bathy/topo grids
    - How many levels of subgrids can be nested within regional grid
    - Constraints on how nested grids align
- Most elements are hard-coded
  - Control parameters with different names, values, meaning
  - Formats of initial conditions, outputs, etc.

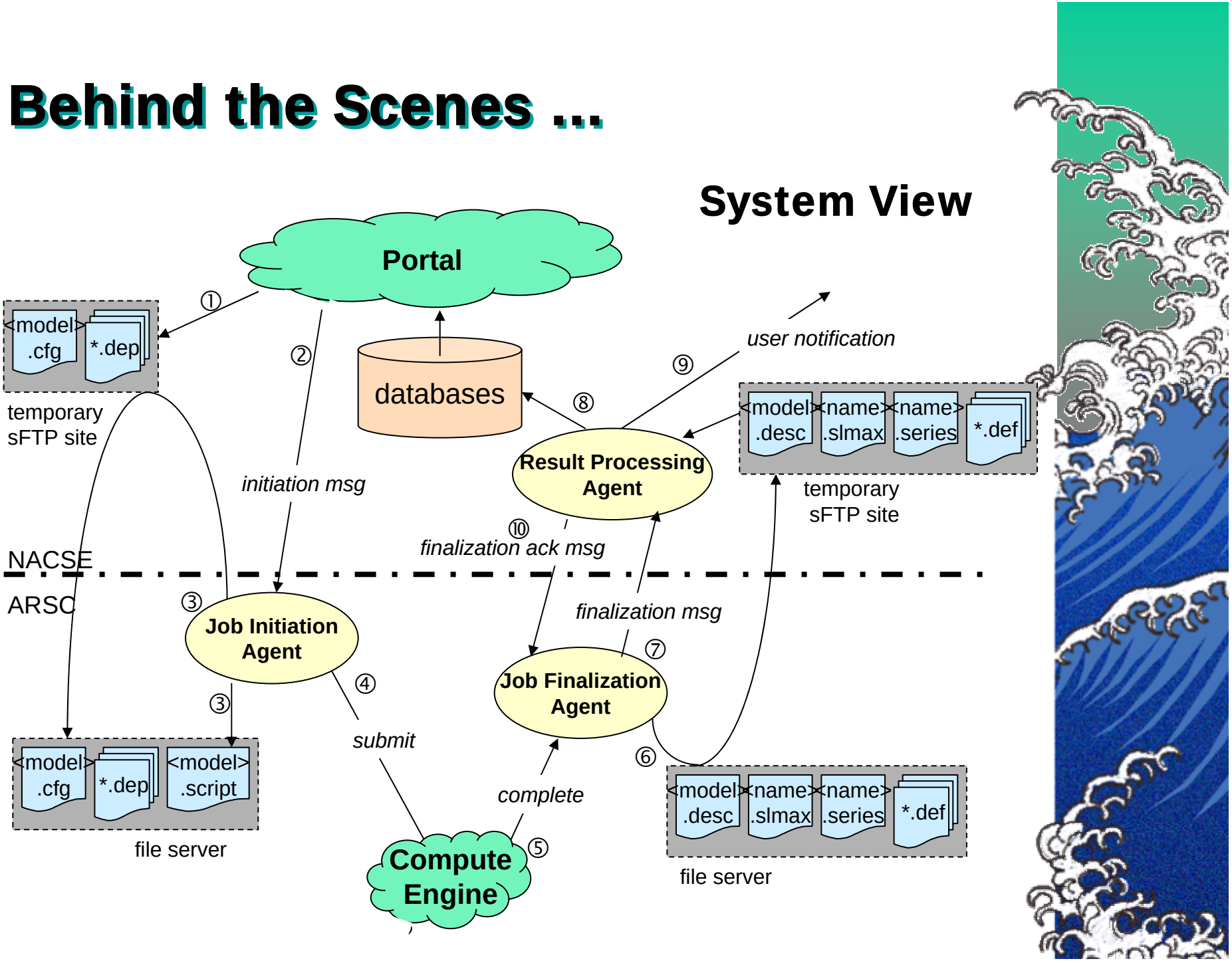
Not as Easy as It Sounds ...



Extensible IT Adds More Complexity

- Geodatabase (rather than simple input/out files)
  - To continue upgrading quality of bathy/topo grids over time
  - To support quick visualization of results using standard mapping software
  - To drive simulations (like Katada's) and 3D visualizations (like Bailey's) too
- Software agents
  - Link database and computational engines at different locations
  - Enforce needed security

Behind the Scenes ...



Where Things Stand

- Two models have been ported to ARSC supercomputers
- Common formats defined for
  - Bathy/topo grids
  - Control parameters
  - Output grids
- “Wizard”-style interface
  - Guides researcher through selection of model, region, initial conditions
- Hardest part is acquiring reasonably complete bathy/topo data