

GUIDE TO CASCADIA EARTHQUAKES & TSUNAMIS

Outline view of TOTLE resources and an alternate method for locating resources posted on the web site.

The [Cascadia Earthquakes and Tsunamis PowerPoint Presentation](#) presents the active-continental-margin plate tectonic setting of the Pacific Northwest and the associated earthquake and tsunami hazards. For teachers who are new to the subject, there is also a background document on [Earthquakes and Volcanoes in the Pacific Northwest](#). Cascadia Teaching resources on Cascadia Earthquakes and Tsunamis are tailored for a middle school audience but can be adapted to other K-14 levels. We recommend that you download the PowerPoint presentation to examine TOTLE resources in their logical sequence.

Resources Featured in the PowerPoint Presentation by Topic:

TOPIC: Cascadia plate tectonics and EarthScope Plate Boundary Observatory (PBO)

COMPUTER ANIMATIONS:

[Cascadia plate tectonic cross section](#).

[GPS observations of active continental margin tectonics and earthquakes](#).

CLASSROOM ACTIVITIES:

[GPS Gumdrop Lesson Plan](#) shows how PBO data document ongoing compression of Cascadia.

[Cascadia Locked and Loading](#) features regional GPS observations in Cascadia.

VIDEOS:

GPS Introduction Demonstrations [Parts 1 & 2](#) and [Parts 3 – 5](#) provides a teachers' guide for introducing middle school students to tectonic applications of GPS.

TOPIC: Cascadia great earthquakes and tsunamis

COMPUTER ANIMATIONS:

[Subduction zone earthquake causes a tsunami and ghost drowned forest](#).

[The Orphan tsunami of 1700](#).

[The next great Cascadia subduction zone earthquake](#).

CLASSROOM ACTIVITIES:

[Dating past Cascadia Great Earthquakes by Dendrochronology](#).

[Cascadia Tsunami Geology](#) investigates the geologic record of the 1700 great earthquake.

[Cupcake Geology](#) model for coring marine sediment beneath the seafloor.

[Turbidite in a Jar](#) model for submarine landslides initiated by great earthquakes.

[Tsunamis and Floods in Native American Oral Histories](#).

VIDEOS:

[Tsunami Update](#) program on Cascadia tsunamis produced by Oregon Public Broadcasting.

VIRTUAL FIELD EXPERIENCES:

The [TOTLE virtual field trips](#) feature ghost forests and Cascadia tsunami geology.

TOPIC: Cascadia crustal block motions and crustal earthquakes

COMPUTER ANIMATIONS:

[Effects of near-surface geology](#) on intensity of ground shaking.

[Effects of near-surface geology](#) on intensity of ground shaking shown on three seismograms.

[PNW Tectonic Block Model](#).

CLASSROOM ACTIVITIES:

[Liquefaction Activity](#) investigates where and why liquefaction occurred during the 1989 Loma Prieta (World Series) earthquake.

[Relative Earthquake Hazard Activity](#) that includes effects of near-surface geology and liquefaction potential in Portland, Oregon.

Poster: Three types of Cascadia earthquakes, [Seattle version](#).

Poster: Three types of Cascadia earthquakes, [Portland version](#).

[Pacific Northwest Tectonic Block Model Activity](#).

[Pacific Northwest Tectonic Block Model Construction](#).

TOPIC: Episodic tremor and slip

COMPUTER ANIMATIONS:

[Motion of a GPS station](#) in the area of Cascadia that experiences episodic tremor and slip.

[Regional plate-tectonic cross section](#) illustrating episodic tremor and slip.

[Two-block earthquake machine model](#).

CLASSROOM ACTIVITIES:

[Episodic tremor and slip](#) for middle-school Earth science.

VIDEO LECTURES:

Cascadia GPS teaching demonstration [Parts 1 & 2](#).

Cascadia GPS teaching demonstration [Parts 3 - 5](#).

[Demonstration of two-block earthquake machine model](#).

TOTLE RESOURCES ON CASCADIA EARTHQUAKES AND TSUNAMIS

INTRODUCTION TO EARTHQUAKES AND VOLCANOES OF THE PACIFIC NORTHWEST:

Earthquakes and Volcanoes of the Pacific Northwest PDF

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/EQs&VolcanoesInPNW.pdf>

POWERPOINT PRESENTATIONS:

Cascadia Earthquakes and Tsunamis PowerPoint Presentation

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/PowerPoints/CascadiaEQTsunami.ppt>

Episodic Tremor and Slip Student PowerPoint Presentation

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/PowerPoints/ACTIVITY_ET_Slip_Student_Presentation.ppt

March 11, 2011 Japan Earthquake and Tsunami, Comparisons with Cascadia PowerPoint Presentation

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/PowerPoints/20110311Archive.zip>

Plate Boundary Observatory 2009 Data PowerPoint Presentation

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/PowerPoints/PBODData09.ppt>

Reading GPS Time Series Plots PowerPoint Presentation (UNAVCO)

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/PowerPoints/InstructorPresentation_ReadingTimeSeriesPlots_2009feb.ppt

COMPUTER ANIMATIONS:

Deformation of a Subduction Zone Recorded by GPS Stations

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/GPS_3grid_subduction_Groom.mov

GPS Movement in Subduction Transition Zone

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/GPS_3gridGraphExtract-WithSeismicity.mov

GPS Observation of a Subduction Zone Earthquake

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/Subduction_GPSvidence_LandJumps.mov

Pacific Northwest Crustal Block Animation

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/1.PacNW-model-8my-Narrated.mov>

Pacific Northwest Earthquakes and Episodic Tremor and Slip Events 2006 – 2009

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/PNW_EQs&ETS.mpg

Subduction Zone Earthquake of Active Continental Margin Generating a Tsunami and Ghost Forest

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/ElasticRebound_Subduction.mov

The Next Great Cascadia Subduction Zone Earthquake

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/Cascadia_mega_event.mov

The Orphan Tsunami of 1700

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Animations/OrphanTsunami_PNW_1700.mov

LESSON PLANS:

Cascadia GPS 1 Gumdrop Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/CASCADIA_GPS_Gumdrop_LessonPlan_TOTLE.pdf

Cascadia GPS 1 Gumdrop Lesson Student Worksheet

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/Cascadia_GPS_AnalysisStudentWorksheet.doc

Cascadia GPS 2 "Locked and Loading" Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/CASCADIA_GPS_Locked&Loading_LessonPlan_TOTLE.pdf

Cascadia Tsunami Dendrochronology Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/CascadiaTsunamiGeology_Dendrochronology_TOTLE.pdf

Cascadia Tsunami Dendrochronology Student Worksheet, Teacher Information, and Answer Key

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/Dendrochronology_TG_Key.doc

Cascadia Tsunami Geology Annotated Photo

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/TsunamiGeology_PhotoOfDeposits_Anotated.pdf

Cascadia Tsunami Geology Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/CascadiaTsunamiGeology_LessonPlan_TOTLE.pdf

Cascadia Tsunami Geology Photo Cutouts

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/TsunamiCutbankPhotoCutouts.doc>

Cascadia GPS 1 Gumdrop Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/CASCADIA_GPS_Gumdrop_LessonPlan_TOTLE.pdf

Cascadia Tsunami Geology Poster-Size Photo

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/TsunamiGeology_PhotoOfDeposits_LARGE.jpg

Cascadia Tsunami Geology Small-Size Photo

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/TsunamiGeology_PhotoOfDeposits_Small.jpg

Cupcake Geology Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/CupCakeGeology_LessonPlan_TOTLE.pdf

Earthquake Scenario Poster (Seattle)

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/AdditionalResources/EarthquakeScenarioPoster_Seattle.pdf

Earthquake Scenario Poster (Portland)

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/AdditionalResources/EarthquakeScenarioPoster_Portland.pdf

Episodic Tremor and Slip (ETS) Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/EpisodicTremor&Slip_LessonPlan_TOTLE.pdf

Episodic Tremor and Slip Student Worksheet

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/ETS_StudentWorksheet.doc

Earthquake Hazard Maps and Liquefaction

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/EQHazardMaps_Liquefaction-TOTLE.pdf

Liquefaction Teacher and Student Word Document

http://multimedia2.up.edu/Physics/TOLE/EarthquakeTsunamiHazards/LessonPlans/Liquefaction_Teacher&Student_WORD.doc

Native American Oral History of Cascadia Great Earthquakes and Tsunamis

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/PNSNNativeStories.doc>

PNW Tectonic Block Model Pattern

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/AdditionalResources/PNW_block_model_PATTERN.pdf

PNW Tectonic Block Model Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/PNW_TectonicBlockModel_LessonPlan_TOTLE.pdf

PNW Tectonic Block Model – Key

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/PNW_Block_Model_Answers.doc

Tsunamis and Floods in Native American Oral Tradition and Mythology

<http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/NativeAmericanOralTraditionTsunamis.pdf>

Turbidite in a Jar Lesson Bathymetry Map

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/MAP_Turbidites_BathymetryPNW.pdf

Turbidite in a Jar Lesson Plan

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/LessonPlans/TurbiditeInAJar_LessonPlan_TOTLE.pdf

VIDEO LECTURES:

Cascadia GPS Activity Teaching Demonstration Parts 1 & 2

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Videos/GPS_Activity_VideoDemo_Part1&2.mov

Cascadia GPS Activity Teaching Demonstration Parts 3 – 5

http://multimedia2.up.edu/Physics/TOLE/CascadiaEarthquake&Tsunamis/Videos/GPS_Activity_VideoDemo_Part3-5.mov

Demonstration of two-block earthquake machine model.

<http://multimedia2.up.edu/Physics/TOLE/Plates&Earthquakes/VideoLectures/JLahr2-blocks.mov>

VIRTUAL FIELD TRIPS:

TOTLE Virtual Field Experiences

<http://multimedia2.up.edu/Physics/TOLE/VFEs/>