

Physical Geology, 16e

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Detailed List of New Features

Each chapter has been revised and updated, and an overview of notable changes made to each chapter is given below:

Chapter 1 has been updated to reflect the current status of the U.S. petroleum industry. A new photo in box 1.3 shows a more modern image of geologists at work. We have added groundwater to the discussion of the hydrosphere. The section on the Earth's interior has been rewritten to include the concepts of mechanical layers and compositional layers.

Chapter 2 includes some new figures and updated text. The discussion of asbestos in Box 2.4 has been completely rewritten with a new emphasis on mineralogy and health hazards, and new photos have been added.

Chapter 3 has been updated and new web links added. Changes made to figures 3.3 and 3.14B will make them clearer for the reader.

Chapter 4 has been updated with new photos and web links.

Chapter 5 includes a new photo of scenic cliffs formed by differential weathering, and the figure illustrating spheroidal weathering has been revised. Questions at the end of the chapter have been revised and reorganized to better reflect the learning objectives and more clearly follow the flow of the chapter.

Chapter 6 includes a new photo of rounded sediment, and the discussion of how detrital rocks are classified and identified has been expanded. The end-of-chapter questions have been revised to more closely follow the learning objectives.

Chapter 7 has been updated with new photos and web links. A new section on metamorphic facies has been added to the section on plate tectonics and metamorphism. This section shows how the mineral assemblages in metamorphic rocks can provide information on the tectonic setting in which the rock

formed.

Chapter 8 has been updated to improve readability, and new web links have been added.

Chapter 9 has minor rewrites to improve readability. Figure 9.3 is a new image showing an example of a landslide triggered by an earthquake. Figure 9.13 shows the effects of a recent mudslide.

Chapter 10 contains new photos of alluvial fans, stream terraces, high-discharge streams, and the recent flooding in Louisiana. Box 10.1 has been updated to include the latest controlled floods on the Colorado River, and the tables and graphs in box 10.3 have been revised to include the past 10 years of peak discharges along the Cosumnes River. The difficulty of estimating the size of a 100-year flood due to the lack of long-term records and the extreme weather events associated with climate change are discussed. Questions at the end of the chapter were revised to more closely follow the learning objectives.

Chapter 11 includes a new photo of groundwater contamination at a landfill, and a new photo of the Geysers Field in California. The fracking box has been updated and revised, and figure 1 of box 11.1 now more accurately reflects hydraulic gradient. We have also included new figures and a discussion of renewed subsidence in the Central Valley of California due to over pumping of deep aquifers during the recent historic drought. New web links have also been added.

Chapter 12 has been updated and new photos have been added. Box 12.1 has been rewritten to incorporate the potential impact of climate change on water availability. New web links have also been added to box 12.1.

Chapter 13 includes a revised discussion of flash floods and mudflows in deserts and a new photo of the catastrophic mudflow in southern California that buried more than 100 vehicles on Highway 58 in the Tehachapi Mountains. Box 13.2 includes minor revisions, and figure 13.12 has been replaced with a new photo of alluvial fans and playa lakes. Box 13.4 has been updated to include the first up-close study of sand dunes on a planet other than Earth. The Mars Science Laboratory rover, Curiosity, found miniature sand dunes that are attributed to the thin atmosphere on Mars. Similar large ripples preserved in 3.7-billion-year-old sandstone on Mars suggest the planet may have lost its atmosphere early in its history.

Chapter 14 has been updated and includes new photos of a barrier island along the Atlantic Coast and effects of rising sea level along the Gulf Coast. Web Resources at the end of the chapter have been updated.

Chapter 15 contains minor edits throughout the chapter to help clarify material for the student and improve readability. New photos of deformation along the San Andreas fault and a panoramic photo of Chief Mountain and the Lewis thrust fault in Montana have been added.

Chapter 16 has been updated to include the 2016 Kaikoura, New Zealand, and Amatrice, Italy, earthquakes as well as the human-induced earthquakes in Oklahoma caused by the deep injection of wastewater from oil and gas drilling operations. Spectacular new photos and drone footage of the ground rupture from the Kaikoura earthquake that ripped across the South Island of New Zealand have been added to the Earthquake-Related Hazards section. We have also added a new photo of a trench wall exposing offset layers of sediment along the San Andreas fault. The box "Waiting for the Big One in California" has been revised and updated to include new earthquake probabilities from the 2015 Uniform California Rupture Forecast (UCERF3). New web links detailing the earthquake forecast and simulations of ground motion during earthquakes in northern and southern California have also been added to box 16.3.

Chapter 17 opens with a new seismic tomography image of Earth that shows a large slab of subducted plate that sank through the entire mantle and is preserved below the Indian Ocean. The chapter has been updated to include the new attempt to drill through the oceanic crust to reach the mantle in the southeast Indian Ocean, and also the discovery of a possible new stiff layer in the upper part of the lower mantle based on high-pressure mineral experiments and on seismic tomography showing subducted plates pooling at 1500 km.

Chapter 18 has been updated and contains new photos and web links. Box 18.1 contains new research on tidal-triggered earthquakes on the East Pacific Rise, and the correlation of shallow earthquakes and tidal forces before the 2011 Tohoku earthquake in Japan and the Sumatra-Andaman earthquake in 2004. The “Turbidity Currents” section now contains web links to dramatic new video footage of turbidity currents in submarine canyons along the Baja and Mendocino coasts, and also turbidity currents modeled in laboratory settings. We have also expanded the discussion of submarine cable breaks caused by turbidity currents and the potential risk to the global economy caused by broken telecommunication cables that carry almost all of the digital and voice communications worldwide.

Chapter 19 has minor editing throughout the chapter to update content and improve clarity. The “Continent-Continent Convergence” section has been revised to reflect new mass balance calculations that suggest half of the Indian continent was subducted back into the mantle. The “What Causes Plate Motions?” section has been updated to include recent studies on mantle plumes.

Chapter 20 has undergone minor editing for improved readability.

Chapter 21 has been updated to reflect the rapid changes in the study of climate change. Figures 21.11, 21.12, and 21.18 have been updated to include the most recent data available. New web links have been added throughout.

Chapter 22 has been updated to reflect changes in the demand for, and price of, various resources. New photos and web links have been added.

Chapter 23 has been revised to reflect the current state of knowledge of the solar system. New images have been added where recent missions have produced improved imagery of the planets.

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