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Chapter 1 : Adding Tectonic Plates To Your World Map - World Building School

Here are two plate tectonics maps which show more detail than the maps above. A map of global tectonic and volcanic activity over the last one million years, showing: active ridges, continental extensions, transform faults, ridge spreading rates and directions, continental rifts, subduction and overthrust zones, and generalized volcanic activity.

The division is based on differences in mechanical properties and in the method for the transfer of heat. The lithosphere is cooler and more rigid, while the asthenosphere is hotter and flows more easily. In terms of heat transfer, the lithosphere loses heat by conduction , whereas the asthenosphere also transfers heat by convection and has a nearly adiabatic temperature gradient. This division should not be confused with the chemical subdivision of these same layers into the mantle comprising both the asthenosphere and the mantle portion of the lithosphere and the crust: The key principle of plate tectonics is that the lithosphere exists as separate and distinct tectonic plates , which ride on the fluid-like visco-elastic solid asthenosphere. Tectonic lithosphere plates consist of lithospheric mantle overlain by one or two types of crustal material: Because it is formed at mid-ocean ridges and spreads outwards, its thickness is therefore a function of its distance from the mid-ocean ridge where it was formed. The location where two plates meet is called a plate boundary. Plate boundaries are commonly associated with geological events such as earthquakes and the creation of topographic features such as mountains , volcanoes , mid-ocean ridges , and oceanic trenches. These boundaries are discussed in further detail below. Some volcanoes occur in the interiors of plates, and these have been variously attributed to internal plate deformation [7] and to mantle plumes. As explained above, tectonic plates may include continental crust or oceanic crust, and most plates contain both. For example, the African Plate includes the continent and parts of the floor of the Atlantic and Indian Oceans. The distinction between oceanic crust and continental crust is based on their modes of formation. Oceanic crust is formed at sea-floor spreading centers, and continental crust is formed through arc volcanism and accretion of terranes through tectonic processes, though some of these terranes may contain ophiolite sequences, which are pieces of oceanic crust considered to be part of the continent when they exit the standard cycle of formation and spreading centers and subduction beneath continents. Oceanic crust is also denser than continental crust owing to their different compositions. Oceanic crust is denser because it has less silicon and more heavier elements " mafic " than continental crust " felsic ". Types of plate boundaries Main article: List of tectonic plate interactions Three types of plate boundaries exist, [9] with a fourth, mixed type, characterized by the way the plates move relative to each other. They are associated with different types of surface phenomena. The different types of plate boundaries are: The relative motion of the two plates is either sinistral left side toward the observer or dextral right side toward the observer. Transform faults occur across a spreading center. Strong earthquakes can occur along a fault. The San Andreas Fault in California is an example of a transform boundary exhibiting dextral motion. Divergent boundaries Constructive occur where two plates slide apart from each other. At zones of ocean-to-ocean rifting, divergent boundaries form by seafloor spreading, allowing for the formation of new ocean basin. At zones of continent-to-continent rifting, divergent boundaries may cause new ocean basin to form as the continent splits, spreads, the central rift collapses, and ocean fills the basin. Active zones of mid-ocean ridges e. Convergent boundaries Destructive or active margins occur where two plates slide toward each other to form either a subduction zone one plate moving underneath the other or a continental collision. At zones of ocean-to-continent subduction e. Earthquakes trace the path of the downward-moving plate as it descends into asthenosphere, a trench forms, and as the subducted plate is heated it releases volatiles, mostly water from hydrous minerals , into the surrounding mantle. The addition of water lowers the melting point of the mantle material above the subducting slab, causing it to melt. The magma that results typically leads to volcanism. Aleutian islands , Mariana Islands , and the Japanese island arc , older, cooler, denser crust slips beneath less dense crust. This motion causes earthquakes and a deep trench to form in an arc shape. The upper mantle of the subducted plate then heats and magma rises to form curving chains of volcanic islands. Deep marine trenches are typically associated with subduction zones, and the basins that develop along the active boundary are often called "foreland basins". Closure of ocean basins can occur at continent-to-continent boundaries e. Plate boundary zones occur where the effects of the interactions are unclear, and the boundaries, usually occurring along a broad belt, are not well defined and may show various types of movements in different episodes. The vectors show direction and magnitude of motion. It has generally been accepted that tectonic plates are able to move because of the relative density of oceanic lithosphere and the relative weakness of the asthenosphere. Dissipation of heat from the mantle is acknowledged to be the original source of the energy required to drive plate tectonics through convection or large scale upwelling and doming. The current view, though still a matter of some debate, asserts that as a consequence, a powerful source of plate motion is generated due to the excess density of the oceanic lithosphere sinking in subduction zones. When the new crust forms at mid-ocean ridges, this oceanic lithosphere is initially less dense than the underlying asthenosphere, but it becomes denser with age as it conductively cools and thickens. The greater density of old lithosphere relative to the underlying asthenosphere allows it to sink into the deep mantle at subduction zones, providing most of the driving force for plate movement. The weakness of the asthenosphere allows the tectonic plates to move easily towards a subduction zone. The same is true for the enormous Eurasian Plate. The sources of plate motion are a matter of intensive research and discussion among scientists. One of the main points is that the kinematic pattern of the movement itself should be separated clearly from the possible geodynamic mechanism that is invoked as the driving force of the observed movement, as some patterns may be explained by more than one mechanism. Driving forces related to mantle dynamics Main article: Mantle convection For much of the last quarter century, the leading theory of the driving force behind tectonic plate motions envisaged large scale convection currents in the upper mantle, which can be transmitted through the asthenosphere. This theory was launched by Arthur Holmes and some forerunners in the s [15] and was immediately recognized as the solution for the acceptance of the theory as originally discussed in the papers of Alfred Wegener in the early years of the century. However, despite its acceptance, it was long debated in the scientific community because the leading theory still envisaged a static Earth without moving continents up until the major breakthroughs of the early sixties. Such density variations can be material from rock chemistry , mineral from variations in mineral structures , or thermal through thermal expansion and contraction from heat energy. The manifestation of this varying lateral density is mantle convection from buoyancy forces. Somehow, this energy must be transferred to the lithosphere for tectonic plates to move. There are essentially two main types of forces that are thought to influence plate motion: Plate motion driven by friction between the convection currents in the asthenosphere and the more rigid overlying lithosphere. Plate motion driven by local convection currents that exert a downward pull on plates in subduction zones at ocean trenches. Slab suction may occur in a geodynamic setting where basal tractions continue to act on the plate as it dives into the mantle although perhaps to a greater extent acting on both the under and upper side of the slab. Lately, the convection theory has been much debated, as modern techniques based on 3D seismic tomography still fail to recognize these predicted large scale convection cells. Plume tectonics This section needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. November Learn how and when to remove this template message In the theory of plume tectonics developed during the s, a modified concept of mantle convection currents is used. It asserts that super plumes rise from the deeper mantle and are the drivers or substitutes of the major convection cells. These ideas, which find their roots in the early s, find resonance in the modern theories which envisage hot spots or mantle plumes which remain fixed and are overridden by oceanic and continental lithosphere plates over time and leave their traces in the geological record though these phenomena are not invoked as real driving mechanisms, but rather as modulators. This theory, called "surge tectonics", became quite popular in geophysics and geodynamics during the s and s. Gravitational sliding away from a spreading ridge: According to many authors, plate motion is driven by the higher elevation of plates at ocean ridges. Cool oceanic lithosphere is significantly denser than the hot mantle material from which it is derived and so with increasing thickness it gradually subsides into the mantle to compensate the greater load. The result is a slight lateral incline with increased distance from the ridge axis. This force is regarded as a secondary force and is often referred to as " ridge push ". This is a misnomer as nothing is "pushing" horizontally and tensional features are dominant along ridges. It is more accurate to refer to this mechanism as gravitational sliding as variable topography across the totality of the plate can vary considerably and the topography of spreading ridges is only the most prominent feature. Other mechanisms generating this gravitational secondary force include flexural bulging of the lithosphere before it dives underneath an adjacent plate which produces a clear topographical feature that can offset, or at least affect, the influence of topographical ocean ridges, and mantle plumes and hot spots, which are postulated to impinge on the underside of tectonic plates. Current scientific opinion is that the asthenosphere is insufficiently competent or rigid to directly cause motion by friction along the base of the lithosphere. Slab pull is therefore most widely thought to be the greatest force acting on the plates. In this current understanding, plate motion is mostly driven by the weight of cold, dense plates sinking into the mantle at trenches. However, the fact that the North American Plate is nowhere being subducted, although it is in motion, presents a problem. The same holds for the African, Eurasian , and Antarctic plates. Gravitational sliding away from mantle doming: This gravitational sliding represents a secondary phenomenon of this basically vertically oriented mechanism. This can act on various scales, from the small scale of one island arc up to the larger scale of an entire ocean basin. November Learn how and when to remove this template message Alfred Wegener , being a meteorologist , had proposed tidal forces and centrifugal forces as the main driving mechanisms behind continental drift ; however, these forces were considered far too small to cause continental motion as the concept was of continents plowing through oceanic crust. However, in the plate tectonics context accepted since the seafloor spreading proposals of Heezen, Hess, Dietz, Morley, Vine, and Matthews see below during the early s , the oceanic crust is suggested to be in motion with the continents which caused the proposals related to Earth rotation to be reconsidered. In more recent literature, these driving forces are: Forces that are small and generally negligible are: The Coriolis force [24] [25] The centrifugal force , which is treated as a slight modification of gravity [24] [25]: Ironically, these systematic relations studies in the second half of the nineteenth century and the first half of the twentieth century underline exactly the opposite: Later studies discussed below on this page , therefore, invoked many of the relationships recognized during this pre-plate tectonics period to support their theories see the anticipations and reviews in the work of van Dijk and collaborators. The other forces are only used in global geodynamic models not using plate tectonics concepts therefore beyond the discussions treated in this section or proposed as minor modulations within the overall plate tectonics model. In , George W. In a more recent study, [29] scientists reviewed and advocated these earlier proposed ideas. In a recent paper, [30] it was suggested that, on the other hand, it can easily be observed that many plates are moving north and eastward, and that the dominantly westward motion of the Pacific Ocean basins derives simply from the eastward bias of the Pacific spreading center which is not a predicted manifestation of such lunar forces. In the same paper the authors admit, however, that relative to the lower mantle, there is a slight westward component in the motions of all the plates. The debate is still open. The diversity of geodynamic settings and the properties of each plate result from the impact of the various processes actively driving each individual plate.

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Chapter 2 : USGS: Volcano Hazards Program Glossary

The crust of our planet is cracked into seven large and many other smaller slabs of rock called plates, averaging about 50 miles thick. As they move (only inches every year), and depending on the direction of that movement, they collide, forming deep ocean trenches, mountains, volcanoes, and.

The world is composed of major, minor, and micro tectonic plates. Tectonic plates are gigantic segments of rock that are in constant motion relative to each other. Tectonic Plates consist of oceanic and continental crusts. Oceanic crust is made of seas and oceans while continental crust is made of the land mass. Tectonic Plates form either divergent, transform, or convergent boundaries when they come into contact. Volcanoes, rift-valleys, mountain ranges, and earthquakes are the results of the movement of tectonic plates in relation to each other and occur at their tectonic boundaries. There are major and minor tectonic plates. Found underneath the Pacific Ocean, it is the largest of all tectonic plates. Most of the Pacific Plate is made up of oceanic crust, with the exception of areas around New Zealand and parts of California. The nature of the Pacific Plate was notably responsible for forming the islands of Hawaii. The Hawaiian Islands were originally volcanoes that rose above the water over millions of years to form land masses. These volcanoes were formed by hot spots in the Pacific Plate. The Pacific Plate is almost home to what is known as the Ring of Fire , an area on the floor of the Pacific Ocean where volcanic activity and earthquakes are most active. It consists of continental crust and oceanic crust. A few hot spots underneath the plate are responsible for active seismic activity, the most famous example of which may be the Yellowstone geyser. Eurasian Plate - 67,, sq km The Eurasian Plate has an estimated area of 67,, square kilometers. It is the third largest of the major tectonic plates. Most of the continents of Europe and Asia are in the Eurasian Plate. A number of geological formations can be found on the Eurasian Plate, the most prominent of which is the the Himalayan ranges. The Himalayan mountains formed as a result of a collision between the Eurasian Plate and the Indian Plate. The Eurasian Plate is a geologically active plate, with volcanoes and earthquakes occuring in its territory. African Plate - 61,, sq km The African plate is the fourth largest tectonic plate with an estimated area of 61,, square kilometers. Most of the African continent is on the African Plate. Notably, the Italian island of Sicily is also a part of the African Plate. Antarctic Plate - 60,, sq km The Antarctic Plate encompasses the entire continent of Antarctica, as well as the nearby oceans. It is the fifth largest plate on earth. Indo-Australian Plate - 58,, sq km The Indo-Australian Plate was formed out of a merger of the Australian and Indian plates millions of years ago. When the Eursian Plate and the Indo-Australian plate collided many many years ago, the Himilaya mountains were formed. Some scientists believe that the Indian Plate and the Australian Plate are actually separate plates, and have been for millions of years. South American Plate - 43,, sq km The South American plate is a major tectonic plate that covers 43 million square kilometers around South America and the surrounding Atlantic Ocean. Plate motions between the South American Plate, which moves westward, and the nearby minor plate, the Nazca Plate, has been causing the formation of volcanoes as well as the heightening of the Andes Mountains. Currently, the Somali Plate is moving away from continental Africa at a very small pace which equates to around 20 millimetres per annum. Nazca Plate - 15,, sq km The second largest of all minor plates, the Nazca Plate, stretches for This location has been responsible for the number of volcanic islands and mountainous landscapes on the western coast of South America. Philippine Sea Plate - 5,, sq km The Philippine Sea Plate comprises of over 5 million square km of ocean space adjacent to the Philippines, in the Philippine Sea. The plate also touches upon both Taiwan and Japan in its northern reaches. Arabian Plate - 5,, sq km The Arabian Plate measures for 5 million km squared, mostly across the Arabian Peninsula. The plate also includes parts of the Levant. It lies to the north of South America and to the south of the islands of Cuba and Jamaica. Cocos Plate - 2,, sq km The Cocos Plate is a minor plate that stretches for 2. It is geographically located off of western Central America. The plate is around 23 million years old, which is young in tectonic plate terms. The formation of the Cocos Plate can be traced to seafloor spreading, which generally occurs at mid-ocean ranges. The shifting of the Cocos Plate underneath the North American Plate these movements are called subduction has resulted in a number of powerful earthquake eruptions in the area in recent history. It moves at a speed of around 87 mm every year. Scotia Plate - 1,, sq km The Scotia Plate stretches for 1. The majority of the plate is deeply submerged beneath the Scotia Sea. It is closest to the country of Vanuatu. The Juan de Fuca Plate is part of the famous Ring of Fire , a zone responsible for volcanic activity, mountainous regions, and earthquake activity.

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Chapter 3 : Blank Plate Tectonics Map | Science printables | Pinterest | Plate tectonics, Plates and Map sk

The tectonic plate boundary map shows all the boundaries by type and where the plates are moving in 21 locations throughout the world.

The southern most extent of the Eurasian plate. Central America and parts of the Caribbean shown in greater detail. Features pertaining to tectonic activity, including earthquake zones, volcanic regions, hotspots and rift valleys, are also shown. A selection of recent major earthquakes and volcanic eruptions are highlighted for quick reference. This map uses an unconventional colour scheme to create clear distinctions between the different tectonic plates. Data from the following sources were used in the compilation of this map: About Hello, my name is Ed Merritt. I am a cartographer based in Southampton UK. I established Merritt Cartographic in I am a graduate of Oxford Brookes University, receiving an honours degree in Mapping and Cartography. Having worked in the past for a large publishing company in central London, much of my current work is commissioned for inclusion in reference books. I also produce interactive maps for deployment on websites and in applications as well as products for use on public display panels and signposts. As a freelance cartographer, I have produced custom maps and graphics for a wide range of publishers, charities and media organisations. I enjoy being creative in my work and like to explore new approaches. As a map-maker, I have a natural tendency to pay attention to detail and also to work hard to ensure that I am being as accurate as I can in the work that I produce. For more information on how Merritt Cartographic can best assist you with your project, please send me a message or make contact via the information displayed above and throughout the site. I look forward to hearing from you. The many provinces are shown as are the provincial capitals and other major settlements of the era. Also shown are many of the important Ancient Egyptian sites and temples that remain today. Features resulting from tectonic activity are also shown. The Polar Regions Oregon Trail The Oregon Trail formed the route taken by pioneers during the 19th century as they travelled to the west coast of North America looking for a better quality of life and economic prosperity. The design brief required these maps to be created with a hand-drawn appearance. Hand Drawn Maps Atlantic Ocean A bright and colourful map highlighting the surface currents of the Atlantic Ocean and the topography of the ocean floor. Displayed on an Orthographic projection so as to create a globe like appearance.

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Chapter 4 : Pangea Continent Map - Continental Drift - Supercontinent

Plates & Boundaries The earth's continents are constantly moving due to the motions of the tectonic plates. Closely examine the map below, which shows the 15 major tectonic plates.

Scotia Plate South American Plate A generalized diagram showing the lithospheric situation associated with the formation of convergent, divergent, and transform plate boundaries. Illustration prepared by the United States Geological Survey. Well-defined boundaries include mid-ocean ridges and ocean trenches. These boundaries are usually well enough defined that they can be plotted on a map at a reasonably accurate location. Map showing the geographic location of major mid-ocean ridges. Map by the United States Geological Survey. Click for larger map. Mid-Ocean Ridges Mid-ocean ridges are divergent boundaries where convection currents in the mantle lift the ocean floor and produce a rift in the lithosphere that follows the crest of the ridge. New lithosphere is created by volcanic activity along the crest of the ridge, and the plates on either side of the ridge are moving away from one another. The boundary between the North America Plate and the Eurasian Plate is an example of a divergent boundary at a mid-ocean ridge. All of the plate boundaries that occur down the center of the Atlantic Ocean are divergent boundaries that follow the crest of the Mid-Atlantic Ridge. Map showing the geographic location of major ocean trenches in the Pacific Ocean. Ocean Trenches Ocean trenches form where a plate with a leading edge of oceanic lithosphere collides with another plate. In these situations, an oceanic plate normally subducts into the mantle, forming a topographic low on the ocean floor. The point on the seafloor where the colliding plates are in contact is normally considered to be the geographic location of the plate boundary. Poorly Defined Boundaries Some plate boundaries are poorly defined by topographic expression or lithospheric discontinuities. These types of boundaries must be plotted on a map showing their approximate locations. The southern edge of the Caribbean Plate, passing through northern South America, is an example. More Plate Tectonics Maps Here are two plate tectonics maps which show more detail than the maps above. A map of global tectonic and volcanic activity over the last one million years, showing: Illustration prepared by Paul D. Van der Grinten projection. A map of the tectonic plates of the earth showing the different boundary types in different colors. Locations where plates collide convergent boundaries are shown in red. Locations where plates are spreading divergent boundaries are shown in yellow. And, locations where plates are sliding past one another are shown in orange. This map was prepared by the National Park Service.

Chapter 5 : Plate Tectonics Map By World With Boundaries And Volcanoes â€“ calendrierdelascience.com

World Plate Tectonics This map highlights the plates of the Earth's crust and identifies the locations of the four major types of plate boundary. Features pertaining to tectonic activity, including earthquake zones, volcanic regions, hotspots and rift valleys, are also shown.

Chapter 6 : World Map Of Tectonic Plates Worksheets - Printable Worksheets

symbols on a laminated World Plate Tectonic map. Objectives Learn where volcanoes and earthquakes occur Understand geography Use critical thinking to find plate.

Chapter 7 : Plate tectonics - Wikipedia

The world is composed of major, minor, and micro tectonic plates. A map showing some of the world's major and minor tectonic plates. Tectonic plates are gigantic segments of rock that are in constant motion relative to each other. They make up the lithosphere, which is the Earth's crust and mantle.

Chapter 8 : Interactives . Dynamic Earth . Plates & Boundaries

The movement of tectonic plates will be dealt with in more detail in future articles as you build up the features of your world map. The Tectonic Plates of Our World As an example of the size of tectonic plates and the way they cross over continents I've included a map of the Earth with the tectonic plates overlaid in different colours.

Chapter 9 : List of tectonic plates - Wikipedia

Our Earth is a dynamic planet, as clearly illustrated on the main map by its topography, over 1, volcanoes, 44, earthquakes, and impact craters. These features largely reflect the movements of Earth's major tectonic plates and many smaller plates or fragments of plates (including.