How is magma formed at divergent boundaries

PLATE TECTONICS, VOLCANOS AND IGNEOUS ROCK EVOLUTION One of the most important ideas in geology is that igneous rocks evolve, and evolve to convergent and divergent plate boundaries. With the exception of hot spots (see below) all volcanic activity takes place at the convergent and divergent boundaries of the plates. At the divergent boundaries of plaque, the ultra-medley magma is brought from the depths of the mantle to the surface through convection cells. This material is very hot, but under enormous pressure, so we would think it was a solid. But it flows, very slowly, centimeters a year. As it approaches the surface, however, the pressure reduction allows the rock to partially melt (or melt fractionally). The fusion serving (mafic) is lower in temperature than the unr melted (ultramafic) serving, and rises to fill the opening of the space between the divergent plates. Here is the creation of a new ocean lithosphere (see ophiolite suite). But it's also the creation of new rocks. The original rock (main rock) has been divided into two fractions, an ultra-bad unrevered residue, and a melted mafia portion. The creation of a new ocean lithosphere involves huge amounts of volcanic activity, typically in the form of fissure volcanoes, but most of them we cannot marr because it is below sea level. A second fractional fusion takes place at the convergent plate boundaries (subduction zones). As the ocean lithosphere descends into the mantle, it carries with it a large amount of seawater. Seawater acts as a flow that causes the material above the subduction plate to melt fractionally. This first produces intermediate magmas, and then felsic magmas, and as these rocks are lighter than the magma mafia float higher on earth, forming islands and eventually continents (click on the image for enlargement; or see this link). Intermediate and plush magmas also produce some of the most spectacular and explosive volcanoes in the world: composite type. Common examples include Mount Saint Helens, Mount Rainier, Mount, Vesuvius, Mount Pinatubo, Santorini and Mount Fuji (click for images or descriptions). In fact, all the volcanoes that make up the Andes Mountains, and the Cascade Mountains in the northwestern U.S. are of this type. All thanks to plate tectonics and subduction. The following diagram shows a summary of these igneous evolutionary processes. A third important category of volcanic activity has little to do with plate tectonics. In fact, like most hot spot volcanoes volcanoes often (but not always) occur within the plates. They are generated by isolated, stationary, magma that emerge deep into the mantle. Common examples are the shield volcanoes of the Hawaiian Islands, and Yellowstone Park. Go to: The Heat History of Earth's Lithosphere Structure Tectonic Plates and Processes to the divergent boundaries of the Wilson cycle are the areas where two tectonic plates are moving away from each other. Divergent boundaries are constructive boundaries because the magma pushing up the mantle moves away from the mantle as the plates move away from each other. The seabed that extends the divergent boundaries in the middle of the oceans causes the spread of the seabed. As ocean plates separate, they produce cracks at the bottom of the ocean. Magma rises from the mantle and oozes from the cracks like a long, thin underwater volcano. This magma cools to form a new igneous rock crust. Overtime, the cooling magma accumulates to form an elevated ridge called the crest of the middle ocean. The rate of propagation of the seabed depends on the average oceanic crest and can vary from 1 to 20 centimeters per year. An example of a ridge of the middle ocean is the Mid-Atlantic mountain range, which extends from the Arctic Ocean to the southern tip of Africa. The seabed rate that extends in the Mid-Atlantic mountain range averages approximately 2.5 centimeters per year. This equates to 25 kilometers in a million years and as this process has been going on for millions of years, it has resulted in the Atlantic Ocean growing from a small cove of water between Europe, Africa and America to the vast ocean it is today. Proof of seabed propagation can be found in magnetism patterns recorded on ocean floors. The magma of the mantle that oozes from the middle-ocean crest contains iron atoms. These atoms align with the Earth's magnetic field and when the magma solidifies to form a new cortex, the iron atoms lock in position. The solid crust flows away from the mid-oceanic crest in both directions carrying with it the original magnetic orientation. Over time, the Earth's magnetic field is reversed so that the new crust that forms along the crest takes on the new orientation. As the crust feeds steadily and symmetrically away from the middle-ocean ridge and the Earth's magnetic field reverses over and over again a symmetrical striped pattern is created at the bottom of the ocean. Rift Valleys Continental and continental plate divergence results in crack formations. A crack is a fallen area at the point where the plates are separating. As the plates separate, the crust widens and thins, the valley and volcanoes begin to form in and around the area. At the beginning of the formation of cracks streams and rivers flow into the low valley and long lakes can be created. Eventually, the widening bark along the boundary may become so thin that a piece continent can break to form a new tectonic plate. When this happens, water from an ocean can rush to form a new sea or ocean basin in the rupture zone. An example of this can be seen in East Africa, where the Arabic plate is moving away from the African plate. This has resulted in Saudi Arabia being plucked from the rest of Africa and the formation of the Red Sea. Linear feature that between two tectonic plates that are moving away from each other This article needs additional citations for verification. Please help improve this article by adding quotes to reliable sources. Material without source can be challenged and removed. Search sources: Divergent limit – News ? Newspapers? Books? Academic? JSTOR (February 2016) (Learn how and when to delete this template message) Divergent/constructive continental boundary In plate tectonics, a divergent boundary, or a divergent plate boundary (also known as a construction boundary or extension boundary) is a linear feature that exists between two tectonic plates that move away from each other. Divergent boundaries within continents initially produce fissures, which eventually become rift valleys. Most active divergent plate boundaries occur between ocean plates and exist as medium ocean ridges. [2] Divergent boundaries also form volcanic islands, which occur when plates separate to produce gaps that molten lava rises to fill. Current research indicates that complex convection within the Earth's mantle allows the material to rise to the base of the lithosphere below each divergent plate boundary. [3] This supplies the area with large amounts of heat and a reduction in pressure that melts the rock of the asthenosphere (or upper mantle) below the crack area, forming large flows of flood basalt or lava. Each eruption occurs in only one part of the plate boundary at any time, but when it occurs, the opening gap fills as the two opposite plates move away from each other. For millions of years, tectonic plates can move many hundreds of miles away from both sides of a boundary of divergent plates. Because of this, rocks closer to a boundary are younger than rocks farther away on the same plate. Description Bridge through the Ilfagjá Crack Valley in southwestern Iceland, which forms part of the boundary between the Eurasian and North American continental tectonic plates. At divergent boundaries, two plates move away from each other and the space this creates is filled with new bark material from the molten magma that is formed below. It is sometimes thought that the origin of new divergent boundaries at triple junctions is associated with the phenomenon known as hotspots. Here, extremely large convective cells bring large amounts of hot astenospheric material close to the surface, and kinetic energy is believed to be enough to break the lithosphere. The hot spot that may have started the Mid-Atlantic Ridge system currently underlies Iceland, which is at a speed of a few centimetres per year. Divergent boundaries are characterized in the ocean lithosphere by cracks in the ocean ridge system, including the Mid-Atlantic Range and the Rise of the Eastern Pacific, and in the continental lithosphere by rift valleys as the famous Great African Rift Valley. Divergent boundaries can create massive fault zones in the ocean ridge system. Propagation is generally not uniform, so when the propagation rates of adjacent ridge blocks are different, massive transformation failures occur. These are the fracture zones, many of the bearing names, which are an important source of underwater earthquakes. A seabed map will show a rather strange pattern of block structures that are separated by linear features perpendicular to the ridge axis. If you see the seabed between the fracture zones as conveyor belts that carry the crest on either side of the crack away from the propagation center, the action becomes clear. The ridge depths of the ancient ridges, parallel to the current recreation center, will be older and deeper... (thermal shrinkage and sinking). Recognitions[edit] It is on the middle ridges of the ocean that one of the key pieces of evidence was found that forced acceptance of the seabed propagation hypothesis. Airborne geomagnetic studies showed a strange pattern of symmetrical magnetic reversals on opposite sides of ridge centers. The pattern was too regular to be coincident, as the widths of the opposite bands were too paired. Scientists had been studying polar reversals and the link was made by Lawrence W. Morley, Frederick John Vine and Drummond Hoyle Matthews in the Morley-Vine-Matthews hypothesis. The magnetic stripe corresponds directly to Earth's polar reversals. This was confirmed by measuring the ages of the rocks within each band. Bands provide a map of both propagation rate and polar reversals in time and space. Examples Mid-Atlantic Ridge Red Sea Rift Baikal Rift Zone East African Rift East Pacific Rise Gakkel Ridge Galapagos Rise Explorer Ridge Juan de Fuca Ridge Pacific-Antarctic Ridge West Antarctic Rift System Great Rift Valley Other types of plate boundaries Converged boundary Transform boundary See also Seafloor spreading – Process at mid-ocean ridges, where the new oceanic crust forms through volcanic activity and then gradually moves away from the continental drift of the ridge – The movement of Earth's continents relative to each other Subduction Zone – A geological process at the converging boundaries of tectonic plates where a plate moves under the other References - Langmuir, Charles H.; Klein, Emily M.; Plank, Terry (2013). Petrological Systematics of Mid-Ocean Ridge Basalts: Constraints on Melt Generation Beneath Ocean Ridges. Mantle Flow and Melt Generation at Mid-Ocean Ridges. Geophysical monograph series. 183–280. hdl:10161/8316. ISBN 9781118663875. Sinton, John M.; Detrick, Robert S. (1992). Crest magma chambers of the middle ocean. Journal of Geophysical Research. 97 (B1): 197. Bibcode:1992JGR.... 97..197S. doi:10.1029/91JB02508. Toshiro Tanimoto, Thorne Lay (November 7, 2000). Mantle dynamics and seismic tomography. Proc. Natl. Akkad. Akkad. U.S.A. 97 (23): 12409–10. Bibcode: 2000PNAS... 9712409T. doi:10.1073/pnas.210382197. PMC 34063. PMID 11035784. Obtenido de