Geological Society of Nevada
Southern Nevada Chapter
Newsletter

February 2004

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A Discussion of Geologic Features on Venus

DATE: Thursday, February 26, 2004

SPEAKER: Maxwell Blanchard

LOCATION: Room 102 Lilly Fong Geoscience Bldg.

TIME: 5:30 p.m. Social Hour
6:30 p.m. Presentation

HI EVERYONE, well last months meeting was a great success! We saw a lot of new faces as well as some faces we hadn't seen in a while. Thanks to everyone for the great turnout. Steve Castor gave a wonderful talk about the newly published book "Minerals of Nevada" authored by Steve Castor and Greg Furdock. It was a rockhounds paradise.

In other news our chapter is growing! Back in September 2003 our chapter was suffering with an all-time low membership. But we've bounced back thanks to all of you. Our chapter has 57 members and is growing strong, with 15 of those members joining in the past month. We can use all the support you can give so if you've been considering becoming a member now is a great time. We would love to see more UNLV students become involved in the chapter. The more students that we have as members the more likely that GSN scholarships could go toward supporting a UNLV student. Something to think about for the future.

I hope that everyone will be able to attend our next meeting to hear Max Blanchard talk about the geology of Venus. It is the perfect time to talk about planetary geology since the geology of Mars has been a staple in the news these past few months. We are looking forward to seeing everyone in February.

See You Soon,

Robyn

ON THE WEB:

Please visit our chapter website at http://geoscience.unlv.edu/GSN/gsnsc.htm and the main GSN website at www.gsnv.org. Each has important membership information as well as updated meeting and field trip information. I've also updated the list of members on our chapter website to reflect our most recent additions.

Another interesting site on the web is by UNLV Assistant Professor of Geophysics Cathy Snelson for the Las Vegas Valley Seismic Response Project (LVVSRP). To view this site and see what Cathy and the other project investigators are up to go to http://geoscience.unlv.edu/pub/snelson/LVSRP/.

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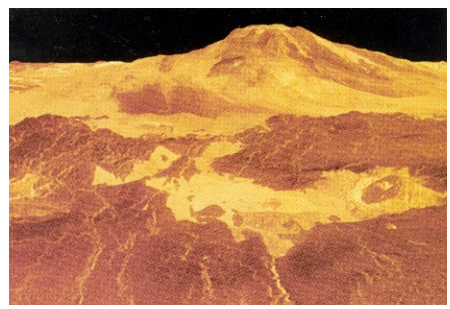
A Discussion of Geologic Features on Venus

Maxwell Blanchard

Missions - There have been 22 missions to Venus (i.e. flyby, atmospheric probe or surface lander). Early probes into the atmosphere & attempts to land on the surface failed because the spacecraft were not designed to withstand the high surface temperatures & pressures encountered. The most useful scientific information has been provided by: Magellan, a mission that mapped the topography of Venus using radar, & Venera, a series of missions that acquired geochemical information & limited images at the landing site.



Oblique perspective of the Maat Mons volcano synthesized from Magellan radar images. This volcano towers 8 km above the surrounding plains. This image is from James Head's paper entitled "Surfaces & Interiors of the Terrestrial Planets", Chapter 12 in the New Solar System, ed. Beatty, Petersen & Chaikin, published by Sky Publ, Cambridge Univ.

Atmosphere - The cloud tops were composed of sulfuric acid (i.e. H_2SO_4) droplets. The pressure at the surface was over 90 bars. The atmosphere's composition was: 96.5% CO_2, 3.5% N. The average surface temperature was 730º K. The intense heat was a consequence of a runaway greenhouse effect in the atm.

Surface - The Magellan spacecraft imaged 98% of Venus' surface. The imaging system penetrated the clouds & observed surface features on the ground at a resolution of 120-300 meters.

Meteorite Impacts: There are 963 impact craters (diameter: 3 - 280 km), on the surface. The surface is unique when compared to all other terrestrial planets because very old heavily cratered terrains do not exist. The crater density in the different rock units observed across the surface is about the same everywhere. The crater density is about 15% of the Lunar maria, therefore, planet's surface is geologically young; perhaps about 500 my old. It appears that volcanic eruptions & associated tectonic activities resurfaced the entire globe about 500 my ago, erasing the previous impact craters.

Volcanism: Volcanoes are ubiquitous. Volcanic plains cover about 80% on the surface. The source vents for these volcanic flows are not apparent. However, the plains do contain meandering "rivers' that appear similar to lava channels on the Earth & Moon. Chemical composition of the volcanic rocks appear similar to Earth's oceanic basalts. Surface rocks are rich in Ca & sulfate minerals. Since lavas enriched in sulfur & carbonate minerals melt at temperatures only a few hundred degrees above the current surface temperature, it may be that the lavas were fed by carbonatite magmas. About 1,100 volcanic features have been identified. They can be divide into 3 sizes: small shield volcanoes with < 20 km diameter; circular shaped features between 20-100 km diameter; & large volcanoes > 100 km diameter exhibiting features like typical volcanoes on Earth. There are 400 unusual volcanic features named coronae on Venus. These have a low central dome surrounded by a shallow trough & many concentric cracks. They are interpreted to represent mantle hot spots.

Tectonics: Highland plateaus & mountain belts occupy 15% of the surface. Tectonic features are ubiquitous throughout the volcanic plains. Wrinkle ridges are the most common feature on the plains. These are long, narrow & sinuous ridges evenly spaced in parallel sets & superimposed upon the widespread volcanic plains. Highly deformed crust named tesserae covers about 8% of the surface. These are intensely crinkled landscapes located on "continent like" crustal plateaus that rise several km above the volcanic plains. Chasmatas are deep narrow canyons that extend between some large volcanoes. They consist of abundant faults & grabens forming rift zones with as much as 6 km vertical relief. The shape & scale of these features are similar to rift zones on Earth. Significant belts of folded mountains exist & are superimposed upon other tectonic patterns The most impressive mountain chain is named Maxwell Montes having steep slopes & high elevations & are part of a high standing "continent like" structural complex.

Interior - Profound differences exist between Venus & Earth; each lose internal heat, but in different ways. On Earth the crust is recycled laterally through plate growth, motion & subduction. By contrast, the volcanic & tectonic structures on Venus suggest recycling occurs vertically with mantle up welling triggering volcanism & mantle down welling resulting in compression. Because the temperature of the planet's crust is above the curie temperature (i.e. the temperature at which magnetism in rocks disappears), no magnetic fields were detected.

Early History - Pioneer Venus measured the ratio of deuterium to ordinary hydrogen of the water molecules in Venus's clouds. The ratio was an astonishing 150 x the Earth's value. The most likely explanation is that Venus once had far more water than now, perhaps even oceans.

Speaker's Background & Education

Educated at San Diego State, San Jose State, & Stanford Universities. Licensed geologist in state of CA & has a Credential from CA for teaching in community colleges. Published over 80 papers. Membership in: AGU, GSA, SEPM, Meteoritical Soc., & AAS. Currently employed at CCSN teaching Astronomy. Past employers include: NASA-Johnson Space Center (space scientist), NASA-Ames Research Center (research scientist), San Jose State Univ. (adjunct professor), General Dynamics-Convair (design engineer) & the Dept of Energy (scientist & deputy project manager).