HLWYM HEmails

From: Neil Coleman
Sent: Thursday, February 19, 2004 2:42 PM
To: John Stamatkos
Cc: BHILL@cnwra.swri.edu; Budhi Sagar; David Ferrill; H. Mckague; Bret Leslie; Howard Larson; John Trapp; James Rubenstone; Mitzi Young; Mike Lee; Philip Justus; Timothy McCartin
Subject: RE: AGU abstract on volcanism
Attachments: AGU ColemanAbramson2.wpd

To all reviewers,
Lee and I are grateful for the comments that each of you provided on our AGU abstract. As always, the more folks look over an item the better it can be. The attached is significantly revised and I believe addresses many of the comments. We have not adopted the idea of withholding publication. Published reports already exist that suggest repository intrusion probabilities could be as high as 1E-6/yr, which means an expected value of 13 dikes could be present today. Where are they? This is a reasonable question that provides food for thought as a lead-in to the ACNW meeting in May.

Again, thanks for your thoughtful ideas, suggestions, etc. provided on short notice.
Regards,
Neil

>>> John Stamatakos <jstam@cnwra.swri.edu> 02/18/04 05:46PM >>>

Neil,

Thanks for asking for my input.

I think you should consider waiting to submit this until you have more time to consider/discuss the comments. I also think you should consider presenting it in a forum where other points of view could be aired simultaneously.

Technically, I think your analysis is overly simple and not well supported. The real issue is temporal recurrence not spatial recurrence. Your assumption about how well we know the mountain is also not well founded (at least in terms of the actual volume of rock examined). You need to re-examine some of the values you cite and then report (ages, probabilities, etc) because they are incorrect.

I have 10 detailed comments at the end of your abstract, which are indexed to the text. I have also color-coded my comments, red with suggested changes, blue with statement that I think are incorrect, and strikeouts for text I think is not needed.

Could you forward to Jim Rubenstone. He is not m my mailing list.

Thanks,
John Stamatakos

-----Original Message-----
From: Neil Coleman [mailto:NMC@nrc.gov]
Sent: Wednesday, February 18, 2004 10:59 AM
To: BHILL@cnwra.swri.edu; DFERRILL@cnwra.swri.edu;

John Trapp; Philip Justus; bhill@swri.edu; bsagar@swri.edu; dferrill@swri.edu; jstamatakos@swri.edu
Cc: Bret Leslie; Howard Larson; James Rubenstone;
Timothy McCartin
Subject: AGU abstract on volcanism

<< File: AGU ColemanAbramson.wpd >> Attached for your review and comment is an abstract for the spring AGU meeting. I would appreciate any comments no later than noon tomorrow (tomorrow afternoon is the AGU deadline). We re-examine an argument raised early in the HLW program concerning probabilities of igneous activity. I think it is useful to do so given that probabilities of dike intersection as high as 1E-6/yr are now being mentioned.

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Subject: RE: AGU abstract on volcanism
Sent Date: 2/19/2004 2:42:10 PM
Received Date: 2/19/2004 2:42:46 PM
From: Neil Coleman

Created By: Neil.Coleman@nrc.gov

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For submission to AGU Spring Meeting

Future Volcanism at Yucca Mt. - Statistical Insights from the Non-Detection of Basalt Intrusions in the Potential Repository

Neil Coleman
Advisory Committee on Nuclear Waste, US NRC

Lee Abramson
Office of Nuclear Regulatory Research, US NRC

Yucca Mt. (YM) is a potential repository site for high-level radioactive waste and spent fuel. One issue is the potential for future igneous activity to intersect the repository. If the event probability is $<$1E-8/yr, it need not be considered in licensing. Plio-Quaternary volcanos and older basalts occur near YM. Connor et al (JGR, 2000) estimate a probability of 1E-8/yr to 1E-7/yr for a basaltic dike to intersect the potential repository. Based on aeromagnetic data, Hill and Stamatakos (CNWRA, 2002) propose that additional volcanos may lie buried in nearby basins. They suggest if these volcanos are part of temporal-clustered volcanic activity, the probability of an intrusion may be as high as 1E-6/yr. We examine whether recurrence probabilities $>$2E-7/yr are realistic given that no dikes have been found in or above the 1.3E7 yr-old potential repository block. For 2E-7/yr (respectively, 1E-6/yr), the expected number of penetrating dikes is 2.6 (13), and the probability of at least one penetration is 0.93 (0.999998). These results are not consistent with the exploration evidence. YM is one of the most intensively studied places on Earth. Over 20 yrs of studies have included surface and subsurface mapping, geophysical surveys, construction of 10+ km of tunnels in the mountain, drilling of many boreholes, and construction of many pits (DOE, Site Recommendation, 2002). It seems unlikely that multiple dikes could exist within the proposed repository footprint and escape detection. A dike complex dated 11.7 Ma (Smith et al, UNLV, 1997) or 10 Ma (Carr and Parrish, 1985) does exist NW of YM and west of the main Solitario Canyon Fault. These basalts intruded the Tiva Canyon Tuff (12.7 Ma) in an epoch of caldera-forming pyroclastic eruptions that ended millions of yrs ago. We would conclude that basaltic volcanism related to Miocene silicic volcanism may also have ended. Given the nondetection of dikes in the potential repository, we can use a Poisson model to estimate an upper-bound probability of 2E-7/yr (95\% conf. level) for an igneous intrusion over the next 1E4 yrs. If we assume one undiscovered dike exists, the upper-bound probability would rise to 4E-7/yr. Higher probabilities may be possible if conditions that fostered Plio-Quaternary volcanism became enhanced over time. To the contrary, basalts of the past 11 Ma in Crater Flat have erupted in four episodes that together show a declining trend in erupted magma volume (DOE, TBD13, 2003). Smith et al (GSA Today, 2002) suggest there may be a common magma source for volcanism in Crater Flat and the Lunar Crater volcanic field, and that recurrence rates for YM could be underestimated. Their interpretation is highly speculative given the 130-km (80-mi) distance between these zones. A claim that crustal extension at YM is anomalously large, possibly favoring renewed volcanism (Wernicke et al, Science, 1999), was contradicted by later work (Savage et al, JGR, 2000). Spatial-temporal models that predict future intrusion probabilities of $>$2E-7/yr may be overly

conservative and unrealistic. Along with currently planned site characterization activities, realistic models could be developed by considering the non-detection of basaltic dikes in the potential repository footprint. (The views expressed are the authors' and do not reflect any final judgment or determination by the Advisory Committee on Nuclear Waste or the Nuclear Regulatory Commission regarding the matters addressed or the acceptability of a license application for a geologic repository at Yucca Mt.)