

GEOLOGIC INTERPRETATION OF DATA SETS COLLECTED BY PLANETARY ANALOG GEOLOGY TRAVERSES AND BY STANDARD GEOLOGIC FIELD MAPPING: A COMPARISON STUDY (PART 1)

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Geologic maps integrate the distributions, contacts, and compositions of rock and sediment bodies as a means to interpret local to regional formative histories. Applying terrestrial mapping techniques to other planets is challenging because data is collected primarily by orbiting instruments, with infrequent, spatially-limited *in situ* human and robotic exploration. Although geologic maps developed using remote data sets and limited “Apollo-style” field access likely contain inaccuracies, the magnitude, type, and occurrence of these are only marginally understood. This project evaluates the interpretative and cartographic accuracy of both field- and remote-based mapping approaches by comparing two 1:24,000 scale geologic maps of the San Francisco Volcanic Field (SFVF), north-central Arizona. The first map is based on traditional field mapping techniques, while the second is based on remote data sets, augmented with limited field observations collected during NASA Desert Research & Technology Studies (RATS) 2010 exercises. The RATS mission used Apollo-style methods not only for pre-mission traverse planning but also to conduct geologic sampling as part of science operation tests. Cross-comparison demonstrates that the Apollo-style map identifies many of the same rock units and determines a similar broad history as the field-based map. However, field mapping techniques allow markedly improved discrimination of map units, particularly unconsolidated surficial deposits, and recognize a more complex eruptive history than was possible using Apollo-style data. Further, the distribution of unconsolidated surface units was more obvious in the remote sensing data to the field team after conducting the fieldwork. The study raises questions about the most effective approach to balancing mission costs with the rate of knowledge capture, suggesting that there is an inflection point in the “knowledge capture curve” beyond which additional resource investment yields progressively smaller gains in geologic knowledge.

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