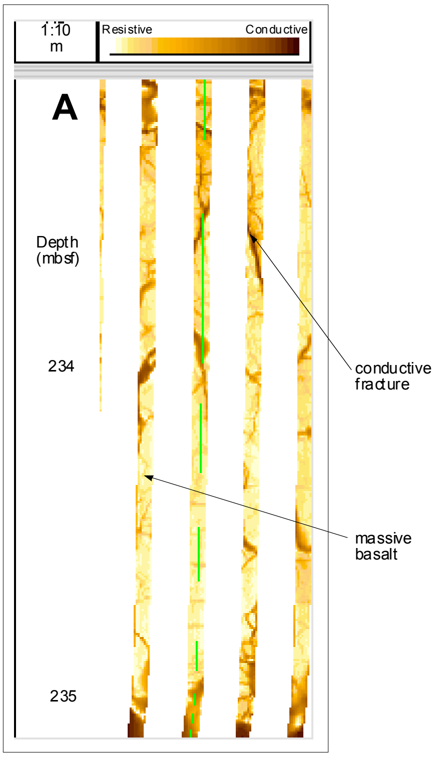
Borehole Image Data Identification of Volcanic Rock Types

Sarah L Haggas Department of Geology University of Leicester

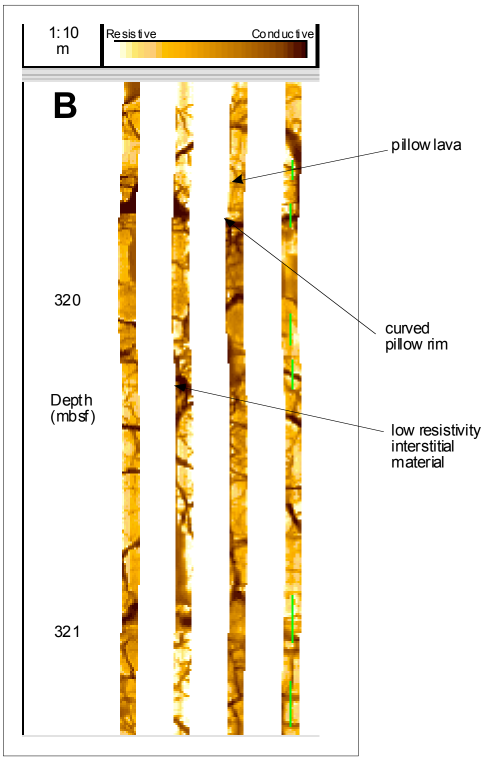
ODP uses many new technologies to increase the quality of the core data One of the problems with drilling the ocean crust is that core recovery is often low and much of the recovered material often consists of small highly disrupted core pieces that are frequently biased toward particular types of rocks (lithologies) In contrast wireline logging provides nearly continuous records of both the chemical and physical properties of a borehole wall which can be used to extrapolate the various volcanic/sedimentary lithologies in areas of reduced core recovery (Brewer et al) One of the most useful wireline logging tools for this process is the Formation Microscanner (FMS) which is a high resolution electrical imaging device Different volcanic lithologies can be identified on the FMS image data by variations in electrical conductivity (Figs A B C) Massive units appear on the FMS images as extensive areas with a uniformly low conductivity and predominantly straight branching fracture patterns Pillow lavas show variable conductivity within a small area but this is less variable than for brecciated units Individual pillow lavas can often be distinguished on the FMS data owing to the curved nature of the pillow boundaries Interstitial material usually has high conductivity Breccias are characterised on the FMS image data by high conductivity which is highly variable within a small area the presence of small high resistivity clasts can often be noted

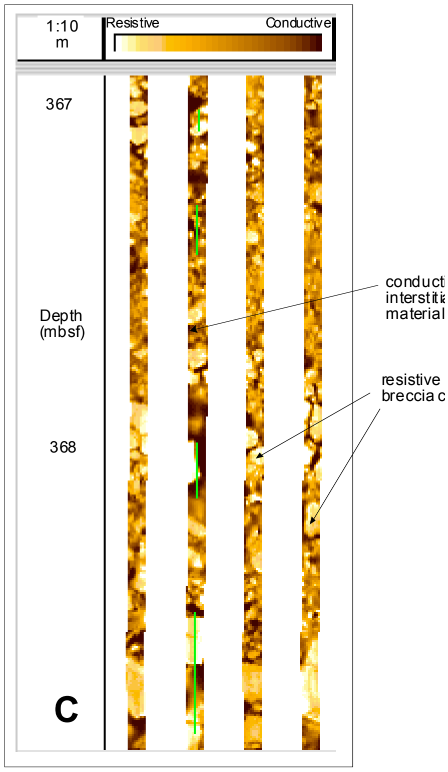
FMS images were used in conjunction with other wireline logging data to reconstruct the lithostratigraphy in ODP Hole A which has relatively low core recovery ( ) The alternative lithostratigraphy constructed using logging data contains considerably more brecciated units ( ) than suggested by the shipboard core descriptions ( ) (Haggas et al) This disparity probably primarily reflects preferential recovery of less fractured massive flows and emphasises the necessity to fully integrate core and logging results in boreholes with reduced core recovery

References:
Brewer, T.S., Harvey, P.K., Lovell, M. A., Haggas, S., Williamson, G. and Pezard, P., 1998. Ocean floor volcanism: constraints from the integration of core and downhole logging measurements. Geol. Soc. London, Special Publications, 136, 341-362.
Haggas, S.L., Brewer, T.S. and Harvey, P. K. Architecture of the volcanic layer from the Costa Rica Rift, constraints from core-log integration, 2002. Journal of Geophysical Research, 107



A. FMS image of a massive flow from ODP Hole 896A





C. FMS image of brecciated material from ODP Hole 896A