

**AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003**

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Global Distribution and Significance of Mud Volcanoes

Mud volcanoes are documented in 41 onshore and 21 offshore areas, and there is indirect geological and geophysical evidence of offshore mud volcanoes in 24 areas. Approximately 1,100 mud volcanoes are documented onshore and in shallow water on continental shelves, and 1,000-100,000 mud volcanoes may exist on continental slopes and abyssal plains. These features are most common in areas of rapid sedimentation, lateral tectonic compression, and geologically recent magmatic activity. Mud volcanoes often occur at the surface and the seafloor as a result of migration of fluidized sediment along active faults due to overpressure, and may also form on top of seafloor-piercing shale diapirs. The study of mud volcanoes is important for a variety of reasons. First, sediments and fluids expelled from these features provide useful information on the geology and petroleum potential of deep sedimentary basins. Mud volcanoes are often associated with large petroleum basins (e.g., Azerbaijan, the Gulf of Mexico) where they expel thermogenic hydrocarbons enriched in C₂₊ gases. Mud volcanoes documented outside of large petroleum basins (e.g., Norwegian Sea, Copper River basin) expel mainly bacterial methane or CO₂. Second, mud volcanoes are considered to be an important source of greenhouse gases. Approximately 30.5 Tg yr⁻¹ of gases (mainly methane and CO₂) may escape from mud volcanoes to the atmosphere and the ocean. Third, submarine mud volcanoes represent a potential geohazard for petroleum exploitation. Lastly, gas hydrate associated with deep-water mud volcanoes may be considered as a potential energy resource.