Figure F1. Location map of Sites U1491–U1498 and 1200 on South Chamorro Seamount.

Figure F2. Idealized cross-section of the Mariana forearc setting, including the relative positioning of serpentinite mud volcanoes. Tectonic Zones 1–6 in the forearc subduction zone complex are keyed to core images in this figure and to some of the photomicrographs in Figure F3. Figure modified after Fryer et al. (1999).

Figure F3. Representative samples keyed to zones and cores in Figure F2, Expedition 366. A. Discoasters (Dsc; *Discoaster variabilis*), coccoliths (C), and volcanic glass (G) in volcanic ash deposits underlying Fantangisña Seamount (Zone 3). Microfossils establish an approximate age of 2.5 Ma for the sediments under the mud volcano, thus establishing the maximum age of onlap of the mudflows from this part of the volcano. B. Elliptical pale green glass bleb with prismatic orthopyroxene (Opx) crystals in a microbreccia of presumed boninitic affinity (Zone 2; plane-polarized light [PPL]). C. Mildly serpentinized porphyroclastic clinopyroxene-bearing harzburgite (40% serpentinization) (Zone 4; cross-polarized light [XPL]). Strained, granulated olivine (Ol) porphyroclasts retain optical continuity. Orthopyroxene deformed with undulatory extinction. Clinopyroxene, commonly along orthopyroxene margins, may be granule exsolution. Spinel penetrates other mineral grain boundaries. D. Blue serpentine forming pseudomorphic mesh textures (Zones 1–4; PPL). Spl = spinel, bast = bastite. E. Ultracataclasite (Zone 5; PPL). Clasts of smeared chert and fossiliferous siliceous limestone within ultrafine-grained matrix. F. Euhedral-subhedral pink augite (Cpx) and plagioclase (Pl) showing equigranular texture (Zone 6; PPL). Labeled, altered plagioclase shows relict albite twin.

Figure F4. Major element variation of serpentinite muds and clasts, Expedition 366. Mafics = entrained metamorphosed mafic clasts. Molar MgO vs. FeO diagram after Hanson and Langmuir (1978), showing Expedition 366 ultramafic clasts and mafic clasts. Most Expedition 366 clasts fall in the residual mantle field, whereas mafic clasts are consistent with lavas formed from basaltic melts via varying degrees of fractional crystallization. Green fields reflect range of values from serpentinized ultramafic rocks collected on Conical and South Chamorro Seamounts and analyzed by Savov et al. (2007).

Figure F5. Immobile trace element variations in serpentinite muds and clasts, Expedition 366. V vs. Ti/1000 discriminator diagram for mafic and ultramafic samples (Shervais, 1982).

Figure F6. Variations of fluid-sensitive elements in serpentinite muds and clasts, Expedition 366.

Figure F7. Elemental variations in metamorphosed mafic rocks compared to serpentinites, Expedition 366.

Figure F8. Gas compositions, Expedition 366. A. H_2 vs. CH_4, Yinazao and Asùt Tesoru Seamounts, Expedition 366. B. CH_4 vs. C_2H_6 diagram for Asùt Tesoru, Conical and South Chamorro Seamounts. Data for Conical and South Chamorro Seamounts from Shipboard Scientific Party (1990, 2002; respectively). Star = potential end-member composition.

Figure F9. Selected interstitial water concentration profiles, Expedition 366. Data for Conical and South Chamorro Seamounts are plotted for comparison to the summit sites (Hulme et al., 2010).

Figure F10. Map of Mariana forearc. Labeled seamounts are active serpentinite mud volcanoes. Shaded regions show where expected reactions are thought to occur within the subduction channel.

Figure F11. Idealized cartoon of the Mariana forearc with results from interstitial water chemical data derived during Expedition 366 and data from two other serpentinite mud volcanoes at a greater distance from the trench (South Chamorro and Conical Seamounts). Slab devolatilization was identified through the compositions of interstitial water. Interstitial water data for Conical and South Chamorro Seamounts from Hulme et al. (2010). For ease of comparison, all elemental concentrations are plotted in millimolar, but B was multiplied by 10 and Na was divided by 10 for ease of representation. Figure modified from Fryer et al. (1999).

Figure F12. Porosity data from Expedition 366 sites with data from Leg 125. Expedition 366 summit sites are plotted in blue, and flank sites are plotted in red. Also shown are porosities from ODP Leg 125 Sites 778 and 779 (flank sites) and 780 (summit site). Green and yellow correspond to sites that differ from common flank or summit values, respectively.

Figure F13. GRA density. A. Holes U1492A–U1492C. Data obtained below 100 mbsf are not plotted. B. Holes U1496A and U1496B.

Figure F14. Calculated heat flow, Expedition 366. Values are derived from downhole APCT-3 formation temperatures and core-based thermal conductivity measurements. Published heat flow data from the area and similar geologic settings are shown for comparison.

Figure F15. Magnetic susceptibility and magnetic intensity of the uppermost 40 m after 20 mT AF demagnetization, Expedition 366. All sites are included except Site U1495, which penetrated to only ~10 mbsf. High magnetic intensity relative to magnetic susceptibility in some cores and holes is likely due to drill string overprint. Asùt Tesoru holes have a higher average susceptibility than the other mud volcanoes.