

IODP Proposal Cover Sheet

1003 - Pre

N. CAVA Volcanic Ash

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Title	Rhythms, Magnitude, and Impacts of Volcanic Ash from Explosive Central American Arc Eruptions		
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Keywords	Volcanic ash, Paleo-volcanism, geochemistry, biosphere	Area	Southern Mexico and Northern Central America

Proponent Information

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Abstract

Forecasting volcanic hazards is essential for protecting society, but the drivers and rhythms of eruptions are not well understood and limit predictive models. Alteration of volcanogenic material in marine sediment has been shown to play an important role in carbon cycling with consequences that may impact climate, but the extent of these interactions is far from clear. To move forward we need to understand the feedback mechanisms and relationships of volcanic ash with deep earth processes, the biosphere, and climate. This project proposes to test four hypotheses: (1a) The rhythms of volcanic activity from the Southern Mexico and Northern Central American volcanic arcs are correlated with glacial-interglacial cycles and/or tectonic events. (1b) Changes in the composition of volcanogenic material deposited over time reflect the evolution of the volcanic arc and reflect changes in sediment composition being subducted to the arc. (2a) The presence of reactive silicates in volcanogenic material plays a major role in the carbon and silica cycles that determine whether CO₂ is released from or sequestered in the sediment. (2b) Microbial abundance, composition, and activity are controlled by the presence of volcanogenic material and its degree of alteration and/or diagenesis. To test these hypotheses, we propose to (A) construct ~5-13 Myr records of the frequency, magnitude, and composition of the volcanic ash (layers and dispersed) in the marine sediments offshore of Southern Mexico and Northern Central America; and (B) constrain the effects of subseafloor post-depositional alteration of volcanogenic material on carbon cycling pathways and the subseafloor biosphere. Completion of these objectives requires drilling 28 sites along the margin of Southern Mexico and the Northern Central American Volcanic Arc where a prolific amount of volcanic ash is buried in the seafloor. Utilizing modern drilling techniques, novel analytical approaches to characterize sediment and pore water, and state of the art biosphere sampling and analyses, the project will generate research opportunities beyond what can be achieved with the marine sediment drilled on earlier DSDP/ODP/IODP expeditions. The resulting research will reveal the role of volcanic ash in deep sea carbon preservation and the biosphere and decipher the relationship and strength of external factors modulating volcanic hazards, thereby helping improve predictions of future explosive volcanic hazards.

Scientific Objectives

Hypothesis 1a: The rhythms of volcanic activity from the Southern Mexico and Northern Central American volcanic arcs are correlated with glacial-interglacial cycles and/or tectonic events.

Hypothesis 1b: Changes in the composition of volcanogenic material deposited over time reflect the evolution of the volcanic arc and reflect changes in sediment composition being subducted to the arc.

Hypothesis 2a: The presence of reactive silicates in volcanogenic material plays a major role in the carbon and silica cycles that determine whether CO₂ is released from or sequestered in the sediment.

Hypothesis 2b: Microbial abundance, composition, and activity are controlled by the presence of volcanogenic material and its degree of alteration and/or diagenesis.

Non-standard measurements technology needed to achieve the proposed scientific objectives

Mission Specific Platform for advanced piston core drilling 100m of marine sediment with detailed stratigraphy intact in 1500-4800 m of water.

Have you contacted the appropriate IODP Science Operator about this proposal to discuss drilling platform capabilities, the feasibility of your proposed drilling plan and strategies, and the required overall timetable for transiting, drilling, coring, logging, and other downhole measurements?

yes

Proposed Sites (Total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-01A (Primary)	10.4360 -87.4909	2845	100	0	100	CA-01A targets an area offshore Central Nicaragua to record the recent to Pliocene explosive volcanic eruptions of Nicaragua. The aim is to use double holes to reconstruct the volcanic history of Nicaragua using discrete ash layers and complementary dispersed ash abundance and composition. In particular the continuation of mafic plinian volcanism known from the upper Pleistocene arc volcanoes 200 km to the east is a goal and sampling for pore water fluids to assist the regional ash alteration hypothesis and associated deep biosphere variations.
CA-02A (Alternate)	10.4300 -87.4764	2884	100	0	100	Site CA-2 records the recent to Late Pliocene (3.5cm/ka= \sim 2.9Ma) volcanic history of Central Nicaragua. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. Ash composition is both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-03A (Primary)	11.3345 -87.3061	1208	100	0	100	Site CA-3 records the recent to Late Pliocene (10cm/ka= \sim 1.0Ma) volcanic history of Central Nicaragua. The record of proximal deposition at this site will contribute to the volumetric estimates of erupted material. Ash composition is mafic and felsic and deposited in a methanic environment on the continental slope creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-04A (Alternate)	11.3332 -87.3064	1220	100	0	100	Site CA-4 records the recent to Late Pliocene (10cm/ka= \sim 1.0Ma) volcanic history of Central Nicaragua. The record of proximal deposition at this site will contribute to the volumetric estimates of erupted material. Ash composition is mafic and felsic and deposited in a methanic environment on the continental slope creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-05A (Primary)	11.1007 -87.8345	3354	100	0	100	Site CA-5 records the recent to Late Pliocene (3.5cm/ka= \sim 2.9Ma) volcanic history of Central Nicaragua. Mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. Ash composition is mafic and felsic and deposited in a suboxic/sulfidic environment (incoming plate, seaward side of trench), creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-06A (Alternate)	11.1007 -87.8383	3327	100	0	100	Site CA-6 records the recent to Late Pliocene (3.5cm/ka= \sim 2.9Ma) volcanic history of Central Nicaragua. Mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. Ash composition is mafic and felsic and deposited in a suboxic/sulfidic environment (incoming plate, seaward side of trench), creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-07A (Primary)	10.7212 -88.9028	3292	100	0	100	Site CA-7 records the recent to Late Pliocene (4cm/ka= \sim 2.5Ma) volcanic history of Central Nicaragua. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more mafic than felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-08A (Alternate)	10.7213 -88.9031	3292	100	0	100	Site CA-8 records the recent to Late Pliocene (4cm/ka= \sim 2.5Ma) volcanic history of Central Nicaragua. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more mafic than felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-09A (Primary)	11.6226 -89.1228	3633	100	0	100	Site CA-9 records the recent to Early Pleistocene (6cm/ka= \sim 1.7Ma) volcanic history of Northern Nicaragua (Cosiquina volcano) and Southern El Salvador (San Miguel). The record of mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more mafic than felsic and deposited in a suboxic/sulfidic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-10A (Alternate)	11.6223 -89.1227	3633	100	0	100	Site CA-10 records the recent to Early Pleistocene (6cm/ka= \sim 1.7Ma) volcanic history of Northern Nicaragua (Cosiquina volcano) and Southern El Salvador (San Miguel). The record of mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more mafic than felsic and deposited in a suboxic/sulfidic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-11A (Primary)	11.9125 -89.7769	3950	100	0	100	Site CA-11 records the recent to Late Miocene (1.2cm/ka= \sim 8.3Ma) volcanic history of Southern El Salvador (San Miguel and Berlin and Pacaya Caldera). The record of mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more mafic than felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy. It will also be used for comparing microbial communities amongst sediments with various ages.
CA-12A (Alternate)	11.9126 -89.7763	3947	100	0	100	Site CA-12 records the recent to Late Miocene (1.2cm/ka= \sim 8.3Ma) volcanic history of Southern El Salvador (San Miguel and Berlin and Pacaya Caldera). The record of mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more mafic than felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-13A (Primary)	11.3836 -90.5815	3691	100	0	100	Site CA-13 records the recent to Late Miocene (1.0cm/ka= \sim 10.0Ma) volcanic history of El Salvador and distal Nicaragua eruptions. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy. It will also be used for comparing microbial communities amongst sediments of various ages.
CA-14A (Alternate)	11.3762 -90.5750	3695	100	0	100	Site CA-14 records the recent to Late Miocene (1.0cm/ka= \sim 10.0Ma) volcanic history of El Salvador and distal Nicaragua eruptions. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-15A (Primary)	11.7453 -90.5184	3593	100	0	100	Site CA-15 records the recent to Middle Miocene (0.8cm/ka= \sim 12.5Ma) volcanic history of Central El Salvador (Ilopango Caldera). The record of mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy. It will also be used for comparing microbial communities amongst sediments of various ages.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-16A (Alternate)	11.7486 -90.5156	3651	100	0	100	Site CA-16 records the recent to Middle Miocene (0.8cm/ka= \sim 12.5Ma) volcanic history of Central El Salvador (Ilopango Caldera). The record of mid-distance deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-17A (Primary)	12.9366 -90.8378	2745	100	0	100	Site CA-17 records the recent to Mid-Pleistocene (10cm/ka= \sim 1.0Ma) volcanic history of Southern Guatemala and Northern El Salvador (Coatepeque/Ayarza Calderas). The proximal deposition will contribute to volumetric estimates of erupted material. Ashes are more felsic than mafic and deposited in a methanic (gas hydrates) environment on the continental slope, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-18A (Alternate)	12.9357 -90.8451	2809	100	0	100	Site CA-18 records the recent to Mid-Pleistocene (10cm/ka= \sim 1.0Ma) volcanic history of Southern Guatemala and Northern El Salvador (Coatepeque/Ayarza Calderas). The proximal deposition will contribute to volumetric estimates of erupted material. Ashes are more felsic than mafic and deposited in a methanic (gas hydrates) environment on the continental slope, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-19A (Primary)	12.4920 -91.0349	4176	100	0	100	Site CA-19 records the recent to Pliocene (2.3cm/ka= \sim 4.3Ma) volcanic history of El Salvador and Guatemala (Coatepeque/Ilopango/Ayarza Calderas). Record of mid-distance deposition will facilitate volumetric estimates of erupted material. Ashes are more felsic than mafic and deposited in a sulfidic environment on the incoming plate (seaward side of trench), creating a distinct combination of variables that influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-20A (Alternate)	12.4922 -91.0364	4200	100	0	100	Site CA-20 records the recent to Pliocene (2.3cm/ka= \sim 4.3Ma) volcanic history of El Salvador and Guatemala (Coatepeque/Ilopango/Ayarza Calderas). Record of mid-distance deposition will facilitate volumetric estimates of erupted material. Ashes are more felsic than mafic and deposited in a sulfidic environment on the incoming plate (seaward side of trench), creating a distinct combination of variables that influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-21A (Primary)	12.2510 -91.5107	3693	100	0	100	Site CA-21 records the recent to Early Pleistocene (6cm/ka= \sim 1.7Ma) volcanic history of Southern Guatemala/Northern El Salvador (Coatepeque/Ilopango/Ayarza Calderas). Distal deposition at this site facilitates volumetric estimates of erupted material. Ashes are more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-22A (Alternate)	12.2507 -91.5103	3693	100	0	100	Site CA-22 records the recent to Early Pleistocene (6cm/ka= \sim 1.7Ma) volcanic history of Southern Guatemala/Northern El Salvador (Coatepeque/Ilopango/Ayarza Calderas). Distal deposition at this site facilitates volumetric estimates of erupted material. Ashes are more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-23A (Primary)	12.5650 -92.0340	3843	100	0	100	Site CA-23 records the recent to Middle Miocene (0.8cm/ka= \sim 12.5Ma) volcanic history of Central Guatemala (Ayarza, Amatitlán and Atitlán calderas). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy. It will also be used for comparing microbial communities amongst sediments of various ages.
CA-24A (Alternate)	12.5660 -92.0331	3844	100	0	100	Site CA-24 records the recent to Middle Miocene (0.8cm/ka= \sim 12.5Ma) volcanic history of Central Guatemala (Ayarza, Amatitlán and Atitlán calderas). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-25A (Primary)	12.3280 -92.7074	3933	100	0	100	Site CA-25 records the recent to \sim Late Miocene volcanic history of Central Guatemala and distal N. El Salvador . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-26A (Alternate)	12.3203 -92.6974	3932	100	0	100	Site CA-26 records the recent to \sim Late Miocene volcanic history of Central Guatemala and distal N. El Salvador . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-27A (Primary)	12.8990 -92.6549	3946	100	0	100	Site CA-27 records the recent to \sim Pliocene volcanic history of Central and Northern Guatemala (Amatitlán and Atitlán). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-28A (Alternate)	12.8937 -92.6636	3954	100	0	100	Site CA-28 records the recent to \sim Pliocene volcanic history of Central and Northern Guatemala (Amatitlán and Atitlán). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-29A (Primary)	13.3058 -93.3695	4005	100	0	100	Site CA-29 records the recent to \sim Pliocene volcanic history of Southernmost Mexico (Chiapanecan Volcanic Arc, El Chichon) and Northern Guatemala (Atitlán Caldera). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-30A (Alternate)	13.3021 -93.4010	4001	100	0	100	Site CA-30 records the recent to ~Pliocene volcanic history of Southernmost Mexico (Chiapanecan Volcanic Arc, El Chichon) and Northern Guatemala (Atitlán Caldera). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-31A (Primary)	13.0064 -94.1796	4072	100	0	100	Site CA-31 records the recent to ~Late Miocene volcanic history of Southernmost Mexico (Chiapanecan Volcanic Arc, El Chichon) and Northern Guatemala (Atitlán Caldera). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-32A (Alternate)	13.0002 -94.1849	4077	100	0	100	Site CA-32 records the recent to ~Late Miocene volcanic history of Southernmost Mexico (Chiapanecan Volcanic Arc, El Chichon) and Northern Guatemala (Atitlán Caldera). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-33A (Primary)	13.7058 -94.1048	4185	100	0	100	Site CA-33 records the recent to Pliocene volcanic history of Southern Mexico (Chiapanecan Volcanic Arc, El Chichon) . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is predicted to be both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-34A (Alternate)	13.7004 -94.1077	4180	100	0	100	Site CA-34 records the recent to Pliocene volcanic history of Southern Mexico (Chiapanecan Volcanic Arc, El Chichon) . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is predicted to be both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-35A (Primary)	14.0833 -94.7295	3999	100	0	100	Site CA-35 records the recent to Pliocene volcanic history of Southern Mexico (Chiapanecan Volcanic Arc, El Chichon) . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is predicted to be both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-36A (Alternate)	14.0809 -94.7348	4044	100	0	100	Site CA-36 records the recent to Pliocene volcanic history of Southern Mexico (Chiapanecan Volcanic Arc, El Chichon) . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is predicted to be both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-37A (Primary)	13.7776 -95.5946	3949	100	0	100	Site CA-37 records the recent to ~Late Miocene volcanic history of Southern Mexico (Chiapanecan Volcanic Arc, El Chichon) . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is predicted to be both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-38A (Alternate)	13.7664 -95.5884	3957	100	0	100	Site CA-38 records the recent to ~Late Miocene volcanic history of Southern Mexico (Chiapanecan Volcanic Arc, El Chichon) . The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is predicted to be both mafic and felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-39A (Primary)	14.4536 -95.3600	4075	100	0	100	Site CA-39 records the recent to Pliocene volcanic history of Southern Mexico (in between volcanic arcs, less volcanogenic input). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The partly ash-free sediment is in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Sites CA-39 and CA-41 have relatively little volcanogenic deposition and will act as a reference or control to investigate the differences in the microbial community and geochemistry when ash is minimal.
CA-40A (Alternate)	14.4563 -95.3689	4068	100	0	100	Site CA-40 records the recent to Pliocene volcanic history of Southern Mexico (in between volcanic arcs, less volcanogenic input). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The partly ash-free sediment is in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Sites CA-39 and CA-41 have relatively little volcanogenic deposition and will act as a reference or control to investigate the differences in the microbial community and geochemistry when ash is minimal.
CA-41A (Primary)	14.8428 -96.3616	3373	100	0	100	Site CA-41 records the recent to ~Late Pliocene volcanic history of Southern Mexico (in between volcanic arcs, less volcanogenic input); Maybe Trans Mexican Volcanic Belt. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The partly ash-free sediment is in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Sites CA-39 and CA-41 have relatively little volcanogenic deposition and will act as a reference or control to investigate the differences in the microbial community and geochemistry when ash is minimal.
CA-42A (Alternate)	14.8194 -96.3629	3381	100	0	100	Site CA-42 records the recent to ~Late Pliocene volcanic history of Southern Mexico (in between volcanic arcs, less volcanogenic input); Maybe Trans Mexican Volcanic Belt. The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The partly ash-free sediment is in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Sites CA-39 and CA-41 have relatively little volcanogenic deposition and will act as a reference or control to investigate the differences in the microbial community and geochemistry when ash is minimal.
CA-43A (Primary)	14.3569 -97.1054	3584	100	0	100	Site CA-43 records the recent to Pliocene volcanic history of Southern Mexico (Southern Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-44A (Alternate)	14.3583 -97.1245	3615	100	0	100	Site CA-44 records the recent to Pliocene volcanic history of Southern Mexico (Southern Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-45A (Primary)	14.9925 -97.4532	3492	100	0	100	Site CA-45 records the recent to ~Late Pliocene volcanic history of Southern Mexico (Southern Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-46A (Alternate)	14.9830 -97.4429	3481	100	0	100	Site CA-46 records the recent to ~Late Pliocene volcanic history of Southern Mexico (Southern Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is more felsic than mafic and deposited in an oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-47A (Primary)	15.2169 -98.4423	3700	100	0	100	Site CA-47 records the recent to ~Late Pliocene volcanic history of Southern Mexico (Central Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in an oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-48A (Alternate)	15.2127 -98.4508	3567	100	0	100	Site CA-48 records the recent to ~Late Pliocene volcanic history of Southern Mexico (Central Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in an oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-49A (Primary)	15.4507 -99.3326	3539	100	0	100	Site CA-49 records the recent to Pliocene volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in an oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-50A (Alternate)	15.4472 -99.3210	4512	100	0	100	Site CA-50 records the recent to Pliocene volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in an oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-51A (Primary)	15.8504 -99.1735	4714	100	0	100	Site CA-51 records the recent to Pliocene (~4Ma, non-linear sedimentation rate) volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of mid-distance deposition facilitates volumetric estimates of erupted material. Ashes are mostly felsic and deposited in a suboxic/sulfidic environment on the incoming plate (seaward side of trench), creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-52A (Alternate)	15.8467 -99.1706	4699	100	0	100	Site CA-52 records the recent to Pliocene (~4Ma, non-linear sedimentation rate) volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of mid-distance deposition facilitates volumetric estimates of erupted material. Ashes are mostly felsic and deposited in a suboxic/sulfidic environment on the incoming plate (seaward side of trench), creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.

Proposed Sites (Continued; total proposed sites: 56; pri: 28; alt: 28; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
CA-53A (Primary)	16.1560 -99.0546	1720	100	0	100	Site CA-53 records the recent to ~1Ma volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of proximal deposition at this site will contribute to the volumetric estimates of erupted material. Ashes are mostly felsic and deposited in a methanic (gas hydrates) environment on the continental slope, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-54A (Alternate)	16.1555 -99.0511	1708	100	0	100	Site CA-54 records the recent to ~1Ma volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of proximal deposition at this site will contribute to the volumetric estimates of erupted material. Ashes are mostly felsic and deposited in a methanic (gas hydrates) environment on the continental slope, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.
CA-55A (Primary)	15.9297 -100.2825	3735	100	0	100	Site CA-55 records the recent to Pliocene volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. This site is key for connecting multiple records of regional stratigraphy.
CA-56A (Alternate)	15.9296 -100.2782	3753	100	0	100	Site CA-56 records the recent to Pliocene volcanic history of Central/Southern Mexico (Trans Mexican Volcanic Belt). The record of distal deposition at this site will contribute to the volumetric estimates of erupted material. The ash composition is mostly felsic and deposited in a oxic/suboxic environment on the abyssal plain, creating a distinct combination of variables that can influence the geochemistry and biosphere. Collectively, the different combinations of ash compositions and geochemical environments at Sites CA-1, CA-3, CA-5, CA-17, CA-19, CA-21, CA-49, CA-51, CA-53 will unravel the microbiological and geochemical drivers and responses affiliated with various ash alteration pathways.