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# Discovery of a pristine Chicxulub impact glass spherule deposit on Gorgonilla Island, Colombia, in the Eastern Pacific Ocean.


By:

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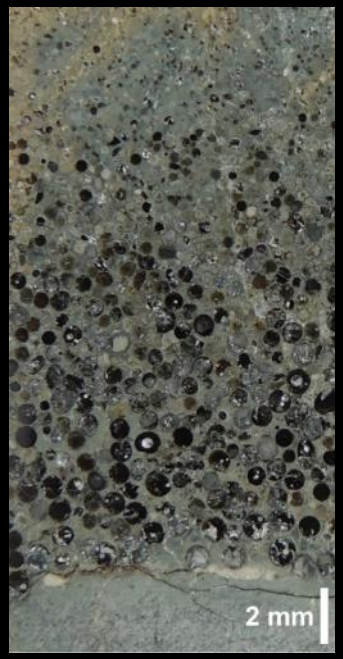
# Gorgonilla K/Pg section




Gorgonilla Island is the first K/Pg section of Colombia, the first one of South America and the Eastern Pacific Ocean which preserves spherules associated to the Chicxulub meteoritic impact.


The outstanding preservation of the deposit will allow us to go further in the knowledge of the consequences of the Chicxulub impact and its role in the mass extinction.

# 2014 – 2015 Field trips

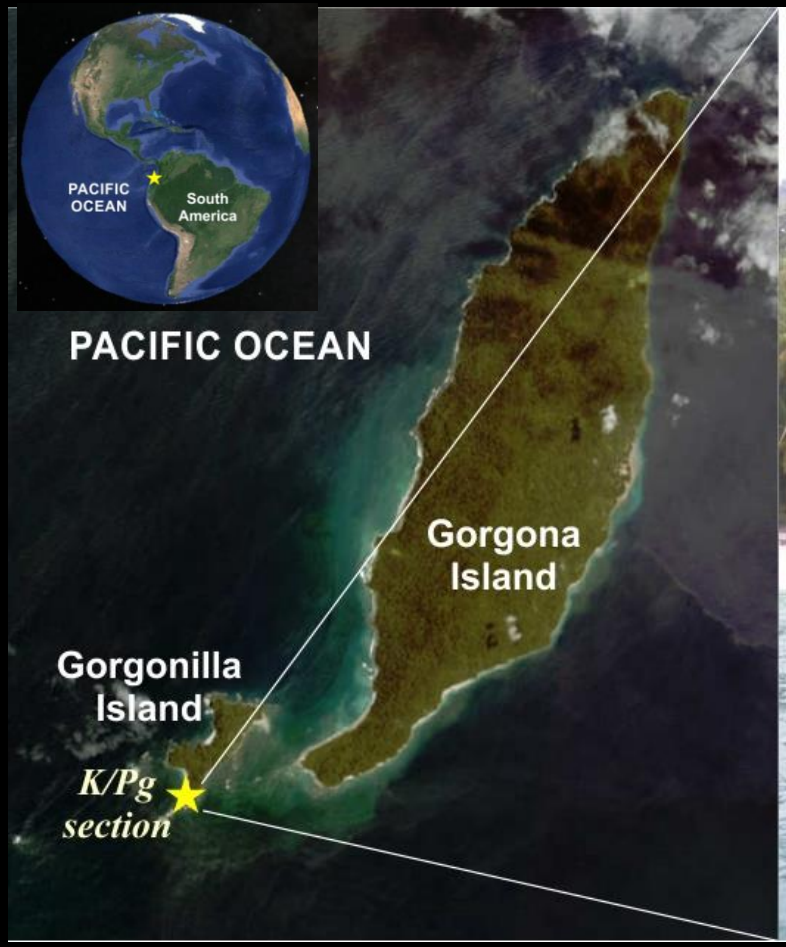

The K/Pg section of Gorgonilla was discovered in June 2014 by a team of Colombian geologists. Since that time, international cooperation has been present by joining experts from Colombia, USA, Switzerland, Germany, Mexico and Argentina around this project.


With the second visit to the site (October 2015) we have initiated a second phase of the work which will include new data and laboratory analisys

# Gorgona Island Natural Park

Gorgonilla island is located within the Gorgona National Natural Park, 20 miles off the Colombian Pacific coast. This is a marvelous park dedicated to the conservation and study of national treasures of this part of Colombia. Gorgona island was a former top security prison until 1984 when was declared as a national natural reserve. At present, the island is on the process to become a UNESCO's World Heritage site.

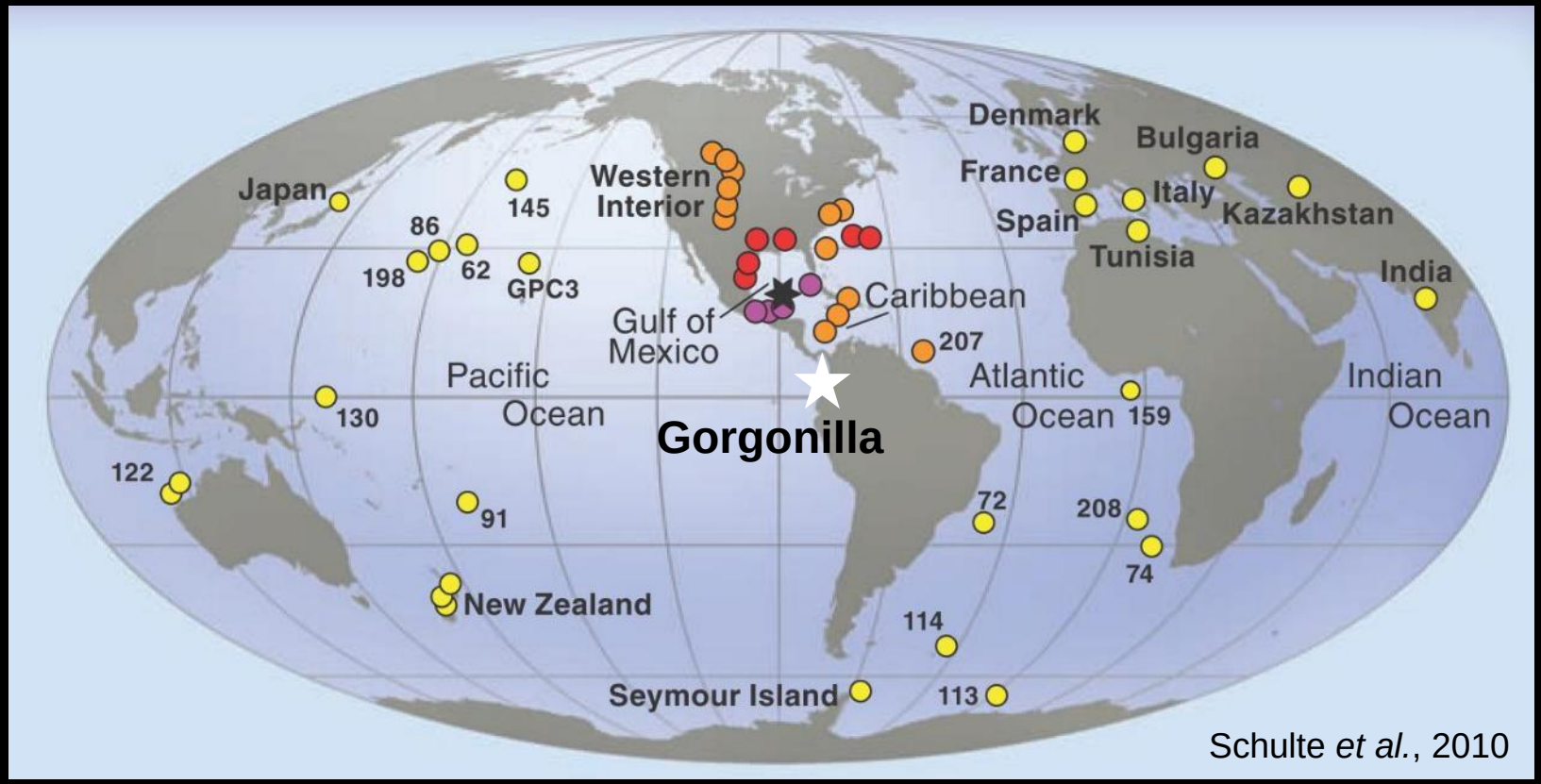
# Location





Gorgonilla is a small volcanic island located 500 meters to the W of the most southerly part of the Gorgona island. Currently, the access to the island is closed to the public. Only research-related-activities are allowed.

# K/Pg Scenario




Global distribution of K/Pg boundary localities and position of Gorgonilla section, which let us to obtain information from the ejecta deposits of Chicxulub in the S – SW cuadrant of the crater for the first time ever.

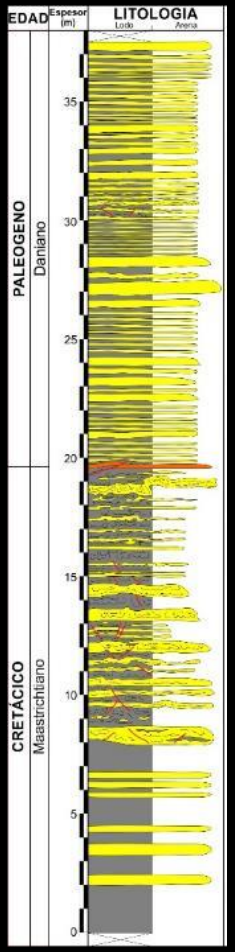
# Gorgonilla K/Pg section


Outcrops on Gorgonilla Island and position of the K/Pg boundary

# Gorgonilla K/Pg section

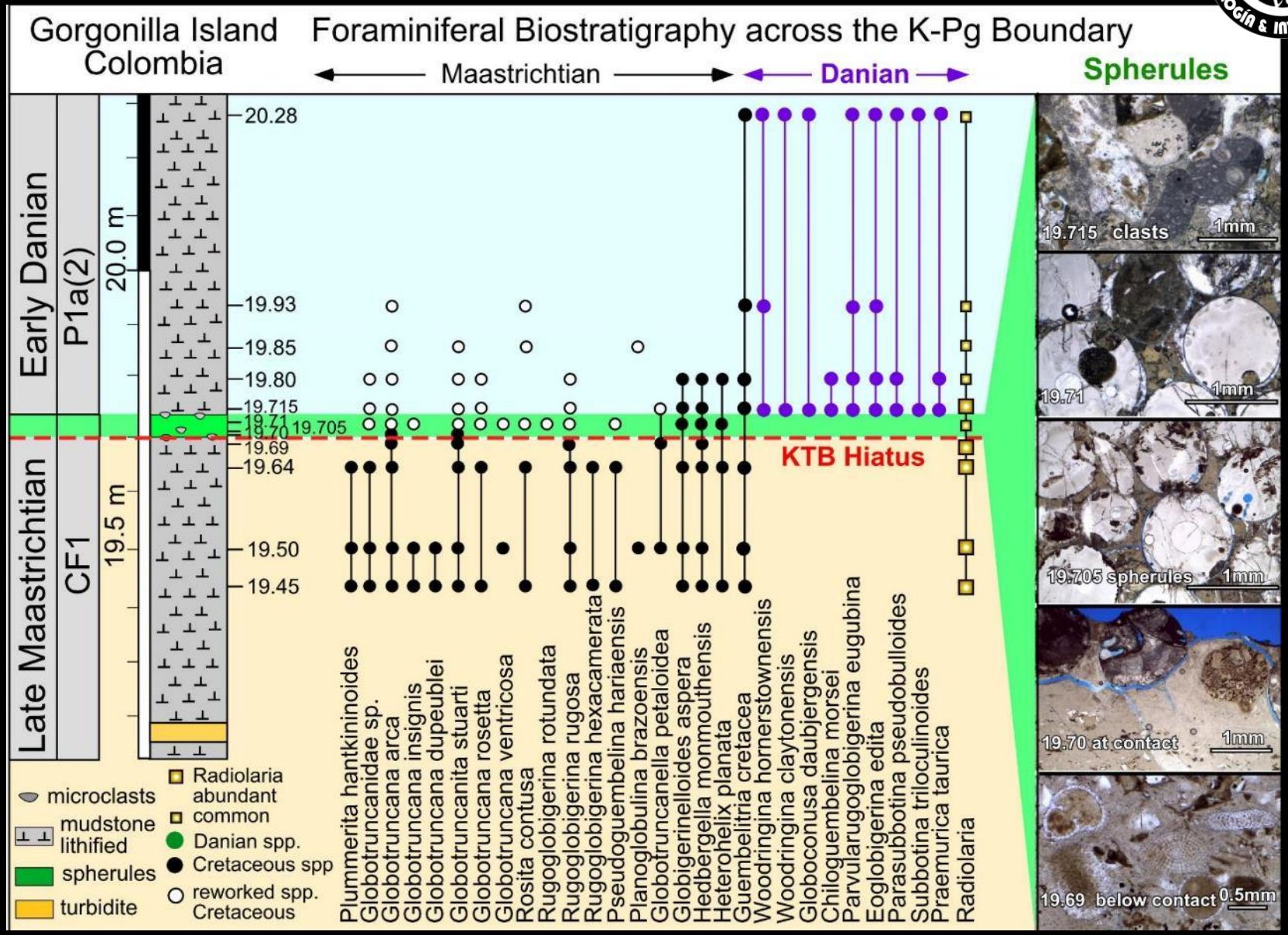
Detail of spherule-rich layer and the amazing preservation of this normal size-graded deposit

# Stratigraphy



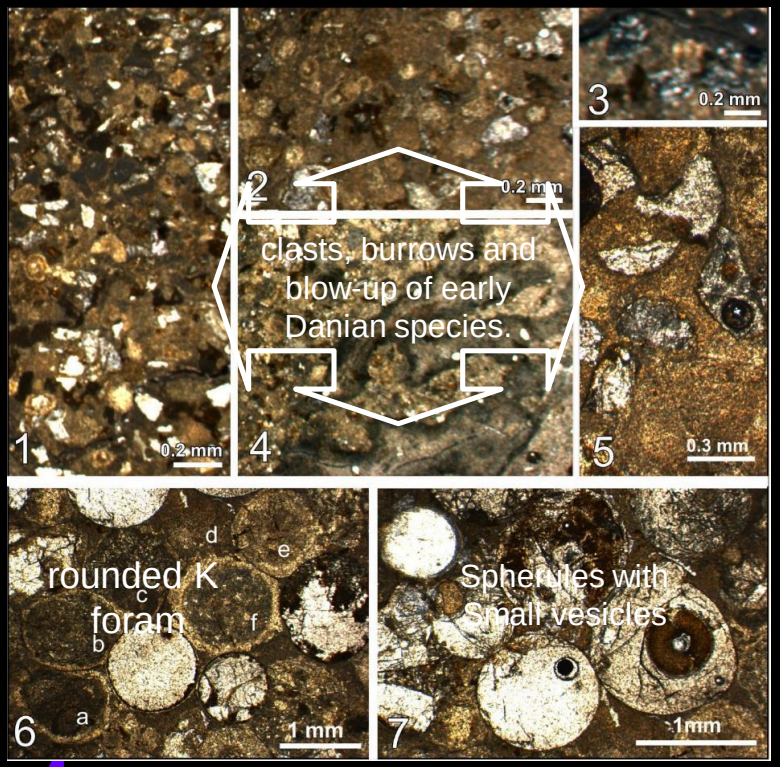

The Gorgonilla K/Pg section is composed of thin-medium bedded tuffaceous sandstone, rhythmically alternating with massive tuffaceous marl, siltstone and claystone, wich represent pelagic bathyal deposition. Gorgonilla spherule layer appears to have remained unaffected from tsunami-reworking or backwash and may thus represent the first parauchtochthonous primary fallout deposit of the Chicxulub impact known to date.

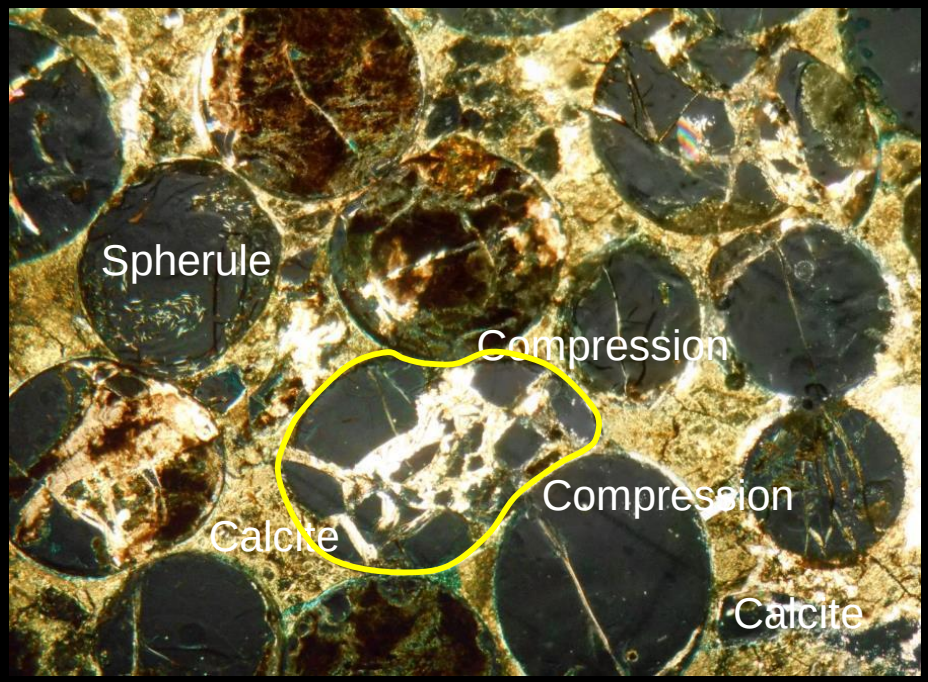
# Age of Gorgonilla K/Pg section



# Age of Gorgonilla K/Pg section

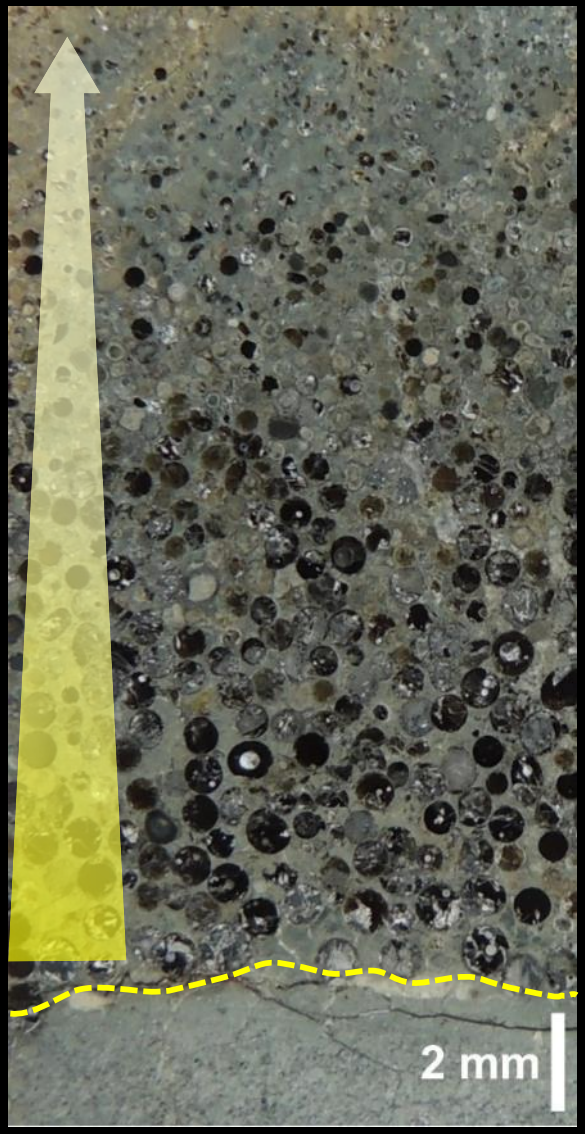
Top of spherule rich layer. Upper part of the P. eugubina zone (P1a(2) at least 100 kyr after the KPg.



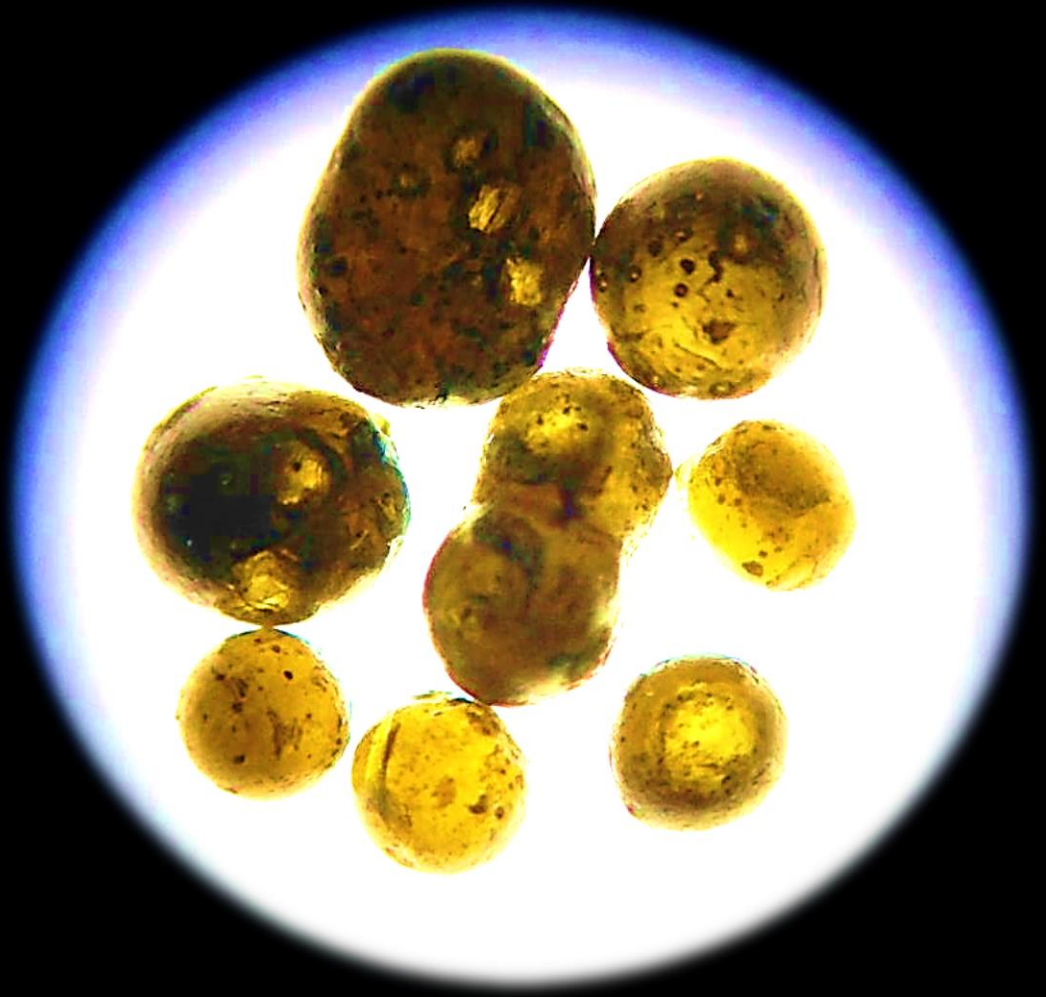

Bottom of spherule-rich layer, with a matrix composed by calcite cement with absence of clastic grains and presence of round and compressed spherules of pristine solid glass

# Spherule-rich layer

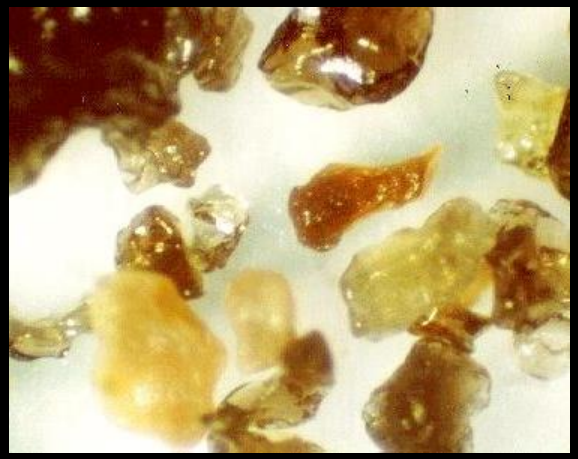



Aspect of one polished section of the spherule-rich layer where the normal size gradation of the deposit is clearly seen.

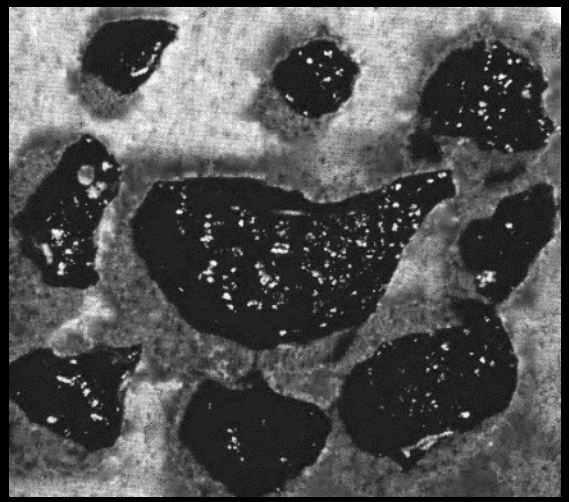
# Glass



Gorgonilla spherules seen on a Stereo Microscope. 90 % of the glass spherules are unaltered



Mimbral, NE de México



Beloc, Haiti

# Backscattered electron microscope

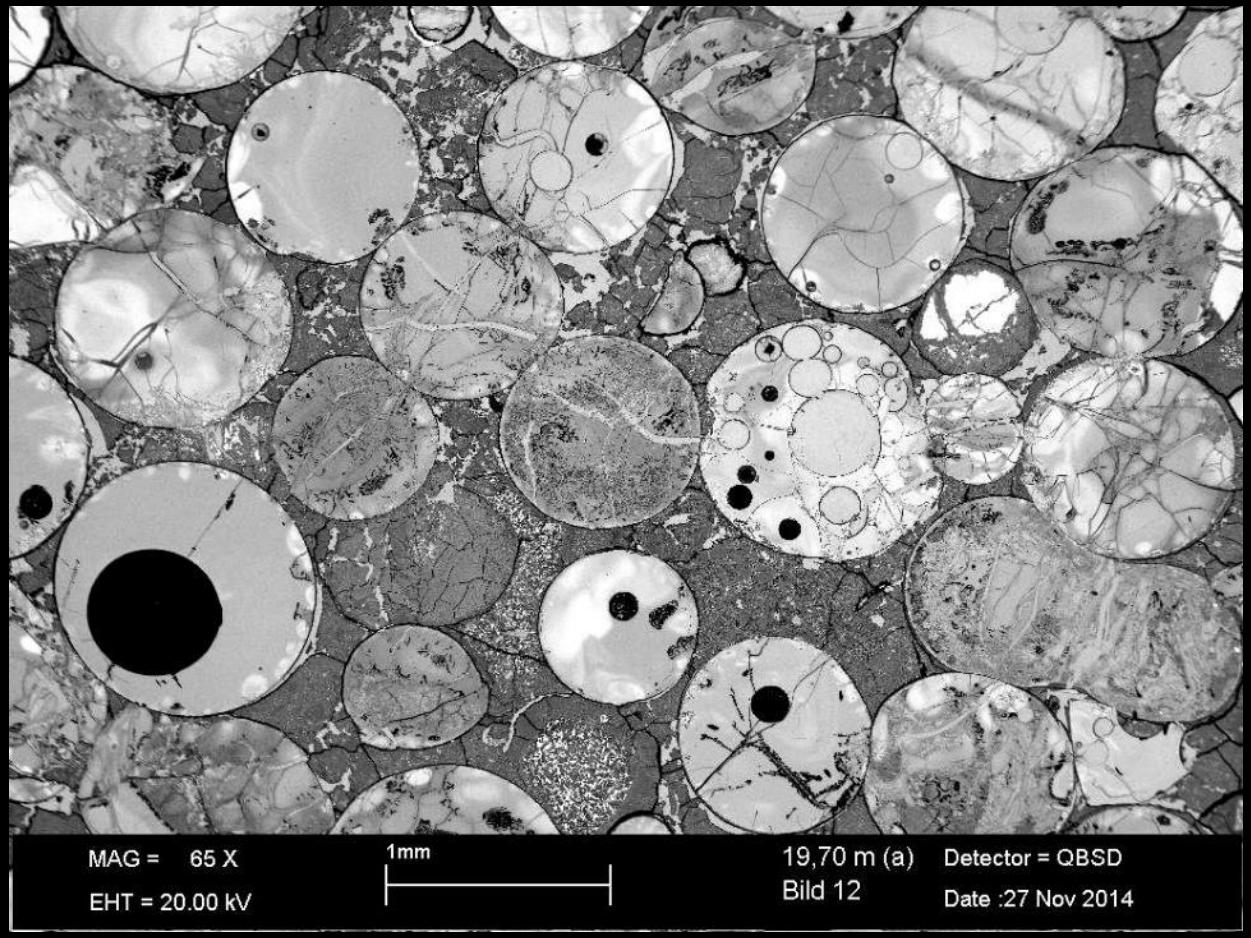
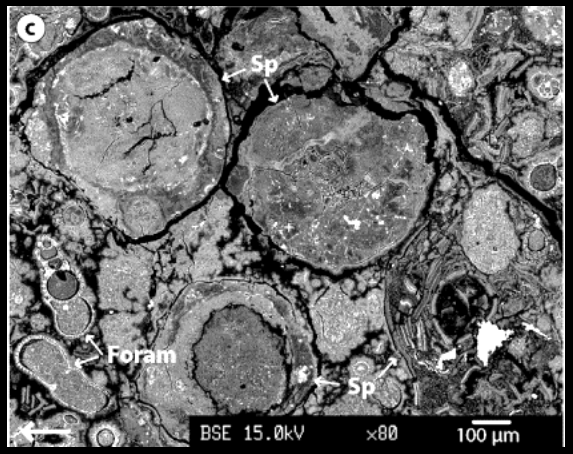
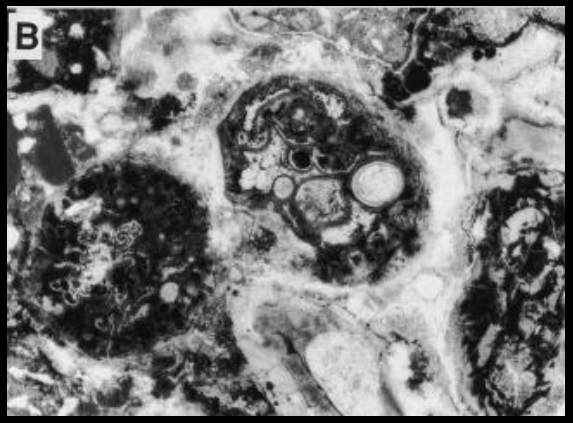



Image taken from the base of the Gorgonilla's spherule-rich layer, showing the incredible preservation of the deposit, which is well cemented, nearly devoid of clastic sediments and preserve rounded and vesicular spherules with great quantities of glass.



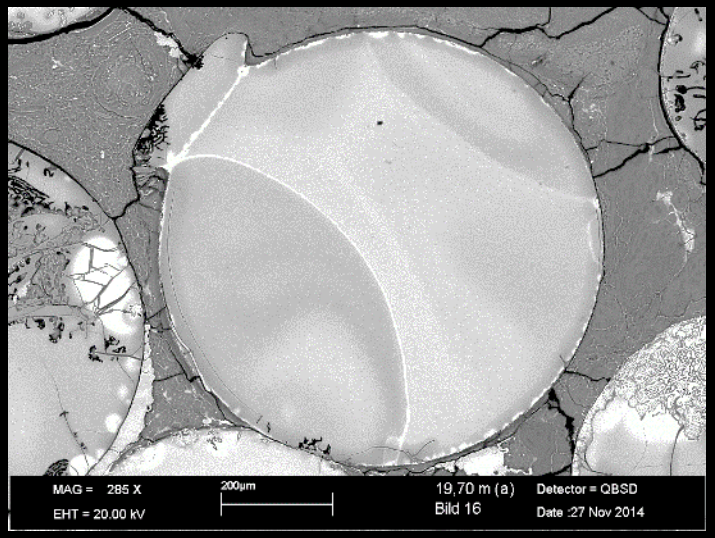

Demerara rise. Schulte *et al,* 2009

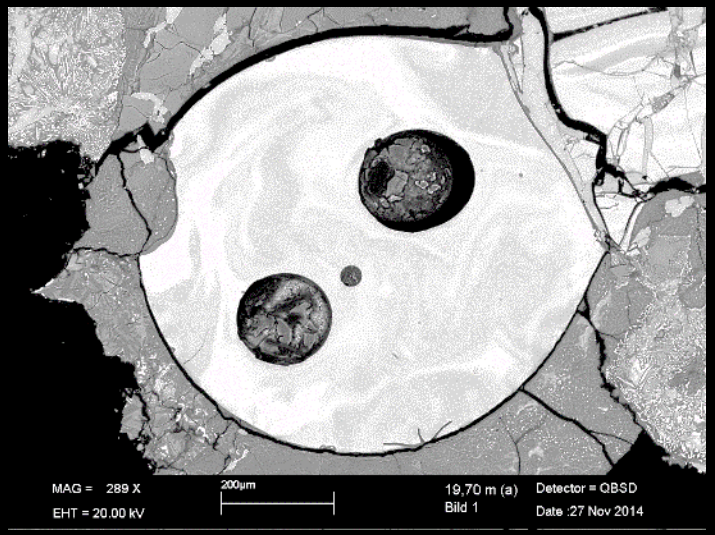


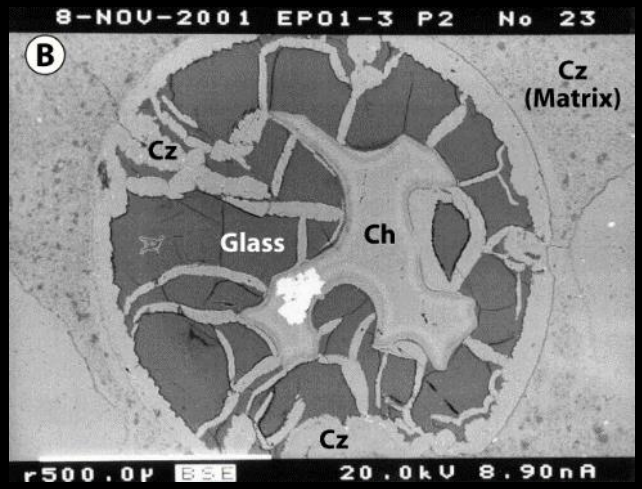

Brazos river. Smit *et al,* 1996

# Preservation of glass

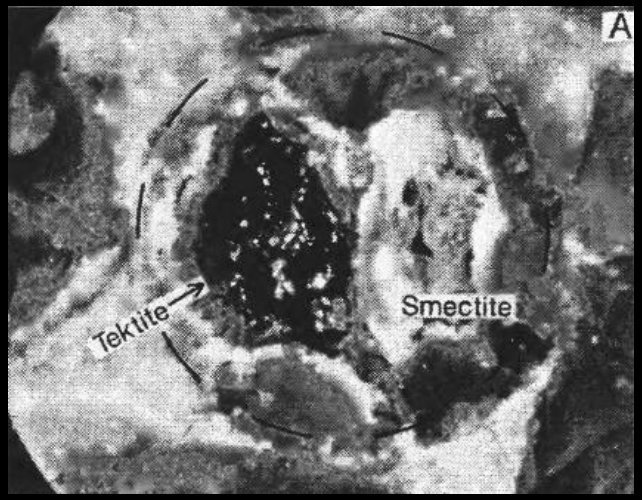
Gorgonilla.



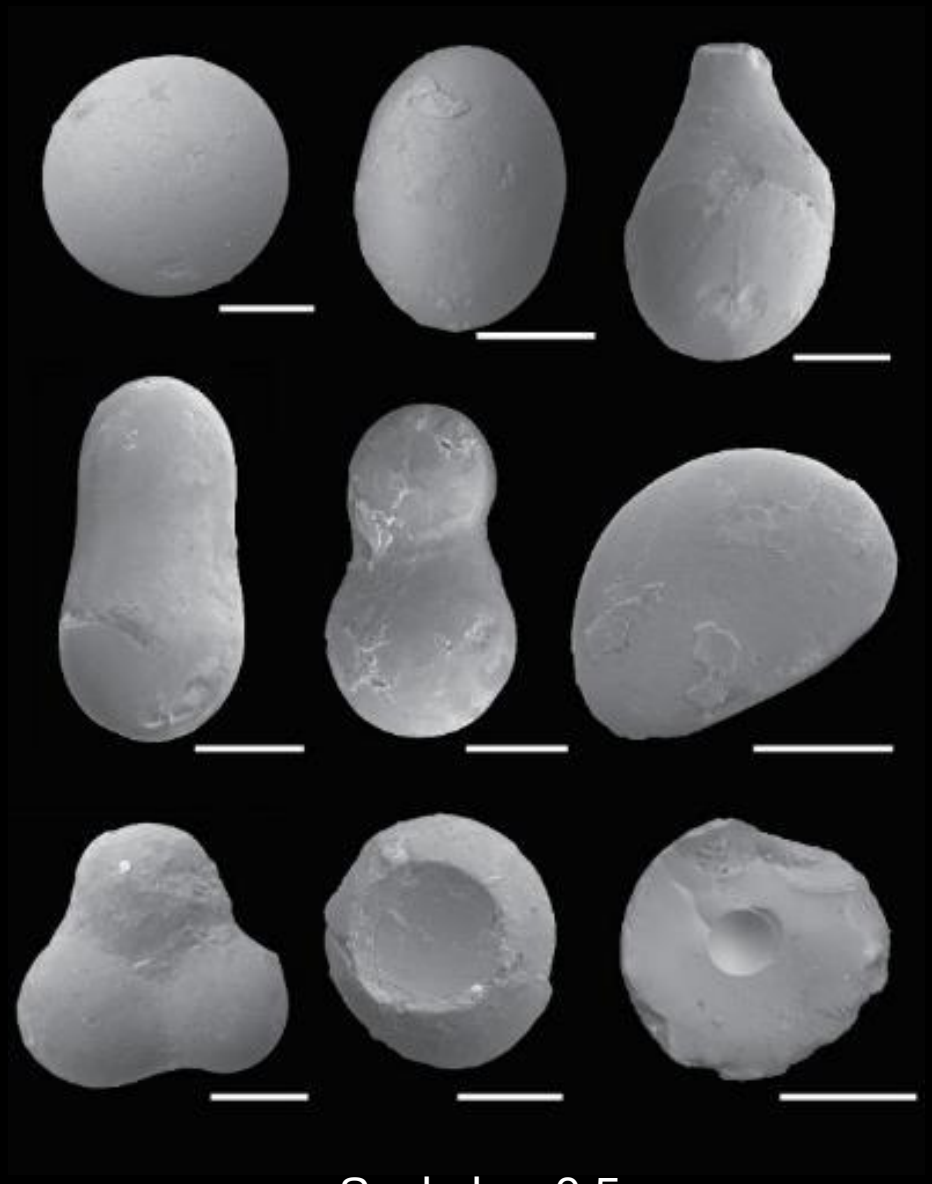




Mimbral, NE de México, Schulte, 2003



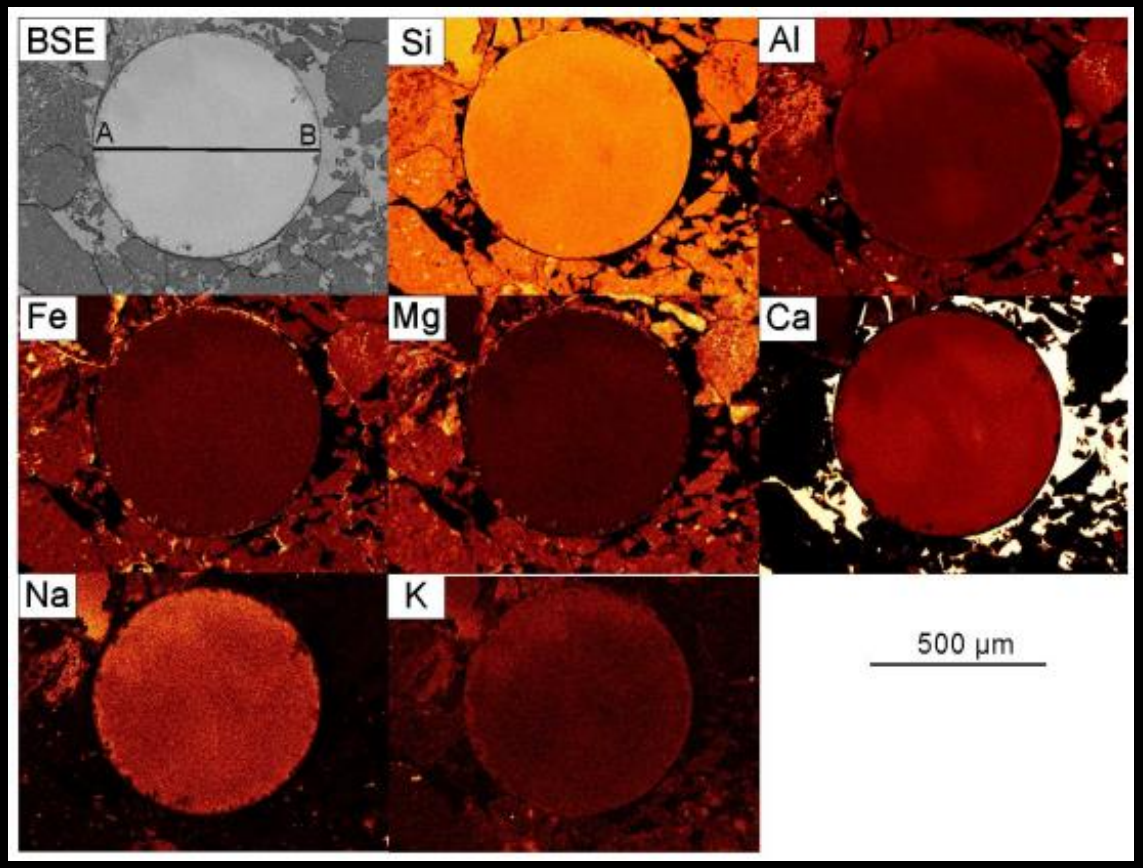

Beloc, Haiti. Izzet et al, 1996

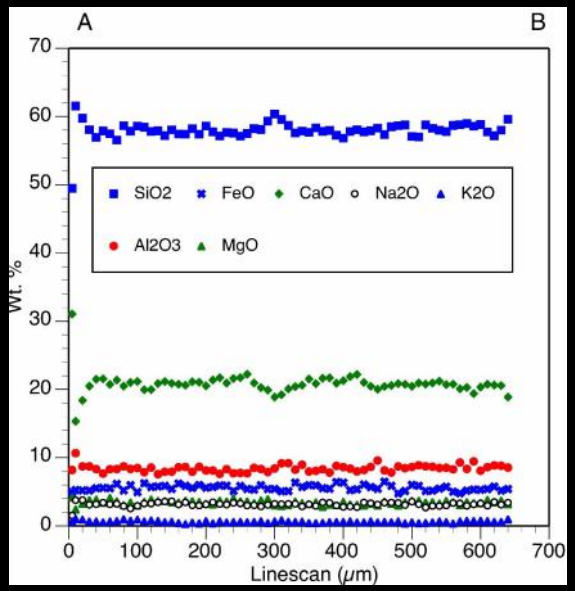
# Morphology (SEM)



Scale bar 0,5 mm

# Microtectites

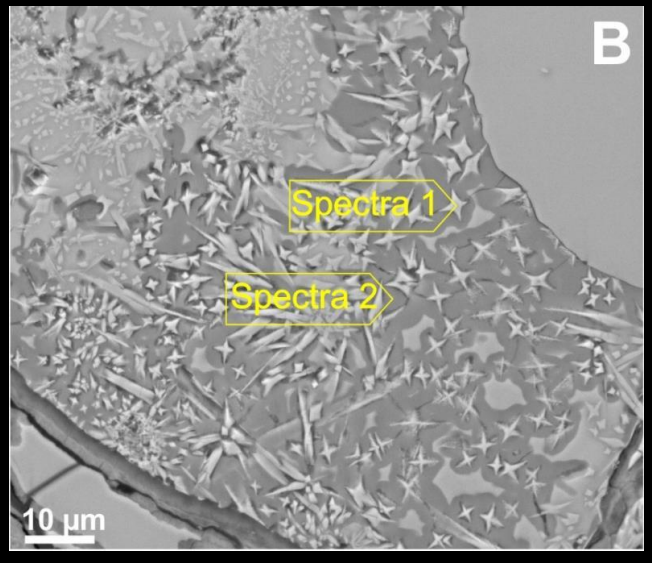


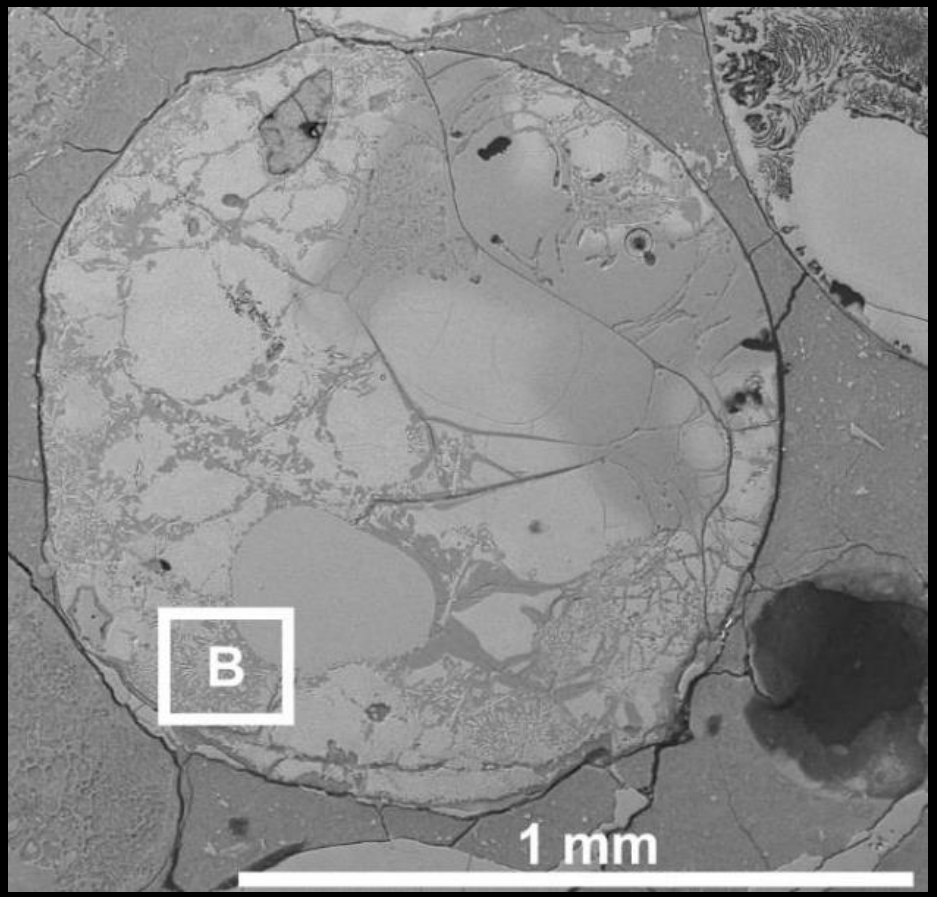



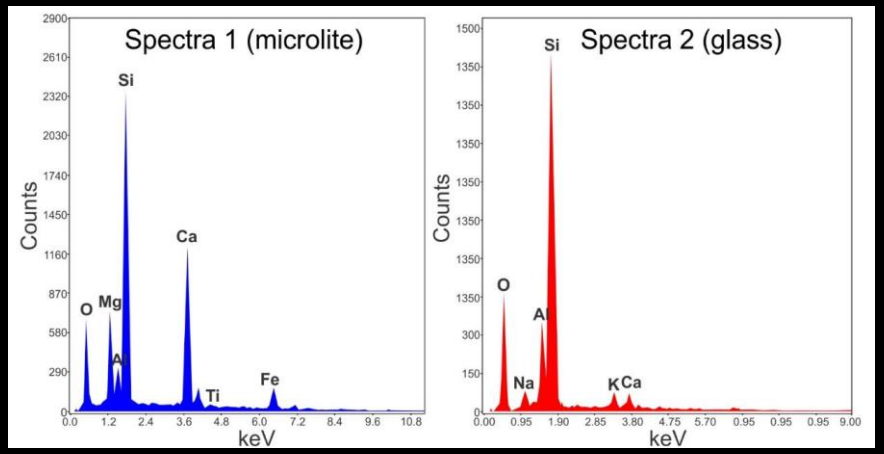

*Chemical maps and linescans of a calcium-rich and aluminium-poor spherule with faint schlieren texture.*

About 70% of the spherules are massive glass (microtektites), while the other 30% contain single, or two or more vesicles.

# Microkrystites

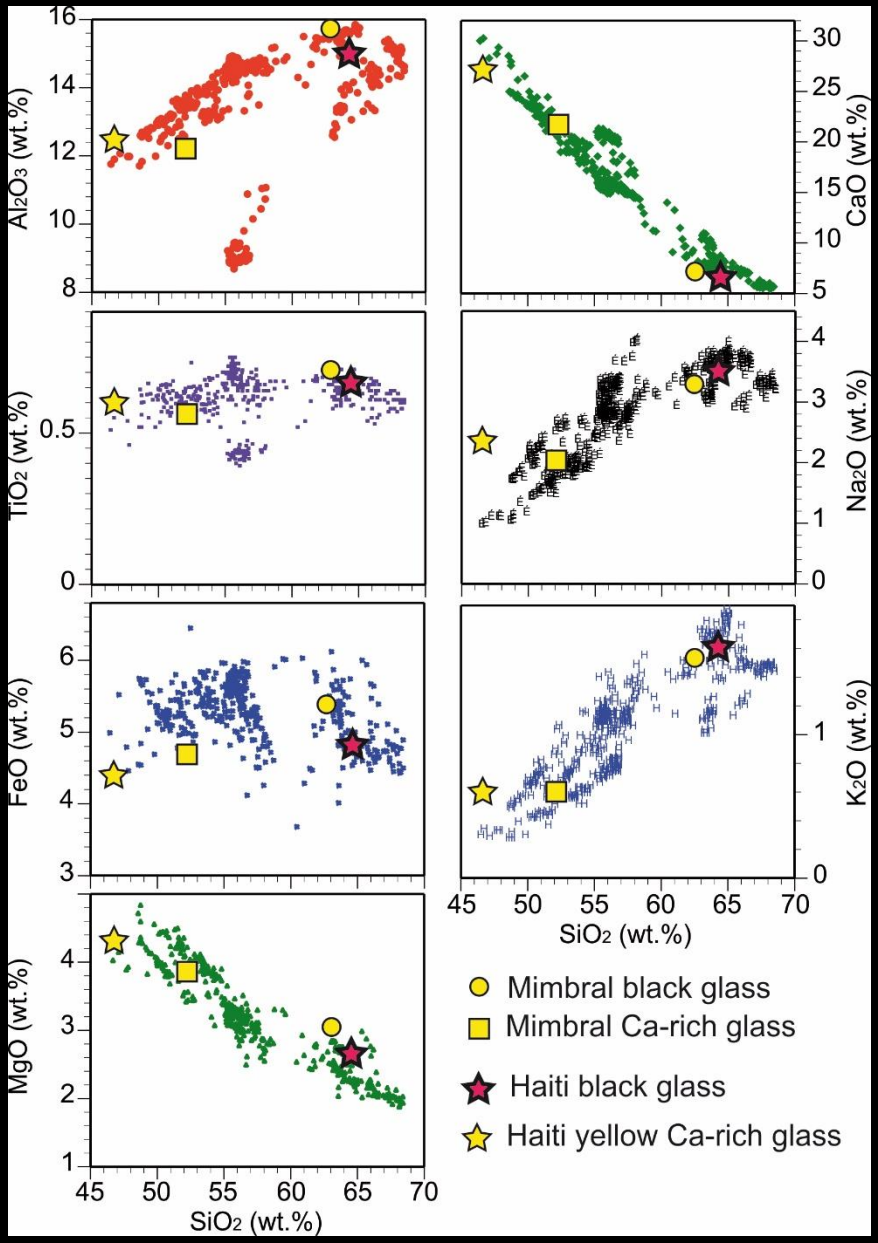



Backscattered electron microscope images occasionally reveal the presence of tiny dendritic and or fibrous crystals, which suggests that some Gorgonilla spherules are microkrystites that formed as droplets condensed from vaporized target rock and the impactor. The mafic composition of the crystals (including Calcium, Magnesium, Iron and Titanium) suggests these are clinopiroxenes.

# Geochemistry




Harker diagrams of selected main and minor elements of Gorgonilla glass spherules. For comparison average compositions of glasses are shown from the Mimbral and Haiti sites. Geochemistry of NE México and Beloc Glases according to Glass and Simonson (2013)

# Significance for Chicxulub impact scenario

The discovery of a new K/Pg bathyal marine sequence on Gorgonilla Island, extends the presence of Chicxulub spherule deposits to the Pacific region of northern South America and to the Eastern Pacific Ocean.

About 70-90 % of the spherules (microtektites and microkrystites) are vitrified, which is also unique among Chicxulub ejecta deposits known to date

The range of main element compositions and the oxide variation are compatible with those from Beloc and Mimbral

Their fluidal-shaped forms, smooth surfaces, and internal textures, such as vesicles and streaked schlieren are indicative of an origin as molten droplets from a highly fluid melt with subsequent exsolution of a gas phase due to pressure release and cooling

Normal size-grading, delicate spherule textures, welded melt components, and absence of bioturbation or traction transport indicate that the Gorgonilla spherule layer represents an almost unaltered primary suspension settling deposit.

Gorgonilla site was close enough, 2700 to 3000 Km to the impact site to receive 20 millimeters of ejecta, yet was located far enough away from the shelf edge to be affected by a destabilization and collapse of the continental margin. Its pelagic position in deep water of the tropical western Pacific likely protected the Gorgonilla spherule layer from reworking by impact-induced tsunami waves.

The detailed study of this deposit, still in progress, will provide key data about the effects of the Chicxulub impact and its role in the mass extinction that took place around the end of the Cretaceous.

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# THANKS

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