Prépa SHS-UE 10 Géographie
Bat ODG Salle GS021-UT2J

les risques Naturels & volcanisme
En France et dans le monde....

GEODE
GEOGRAPHIE DE L'ENVIRONNEMENT

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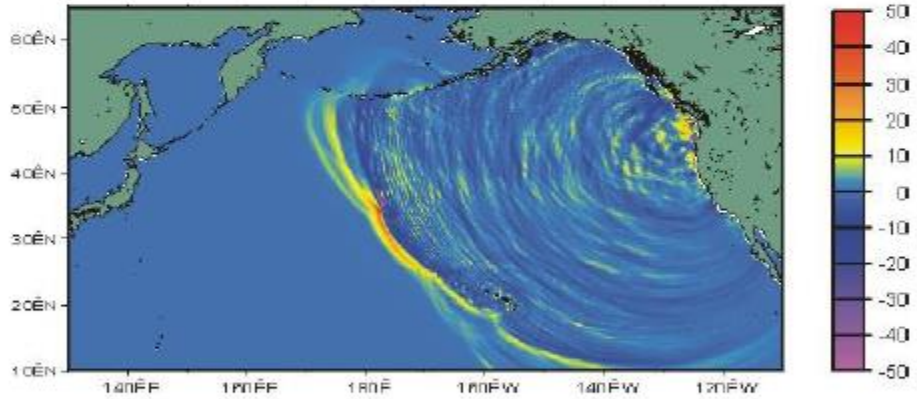
Les risques géologiques…

- Volcanisme: impact local, régional & parfois global!?

- Séismes : impact local & régional (voir très régional!)



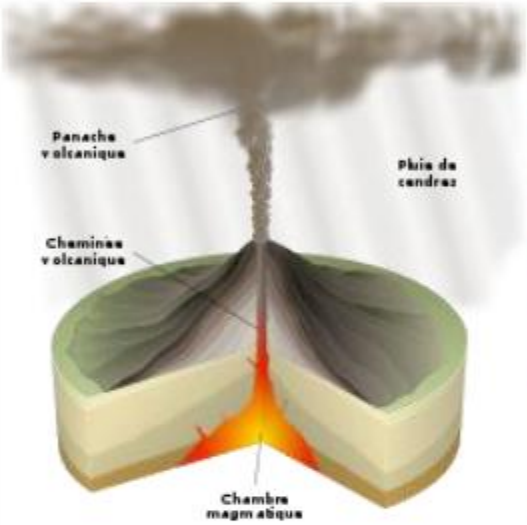
Quels sont leurs conséquences (court et long termes)?
leurs signatures env.?
…. En fait ***quels sont les mécanismes impliqués ??***
Sont ils fréquents ?? Sommes nous exposés?

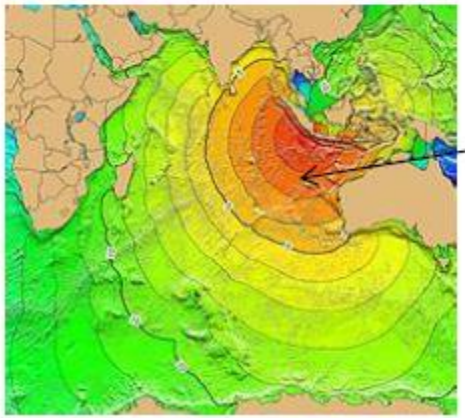
1) Que connait on des risques associés aux éruptions volcaniques ?

Krakatoa 1883: une éruption majeur en Indonésie, le début de la volcanologie

Lithographie de l'éruption du Krakatoa en 1883 datant de 1888.

Localisation	
Pays	Indes néerlandaises
Volcan	Krakatoa
Zone d'activité	Cratère sommital
Dates	Du 20 mai au 21 octobre 1883 (5 mois et 1 jour)
Caractéristiques	
Type d'éruption	Plinienne
Phénomènes	Nuées ardentes, tsunami
Volume émis	20 km^3 de téphra
Échelle VEI	6
Conséquences	
Régions affectées	Détroit de la Sonde
Nombre de morts	36 417

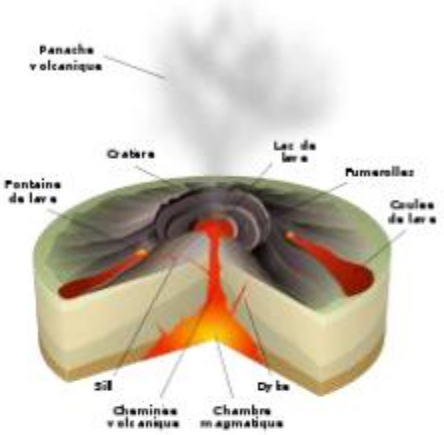




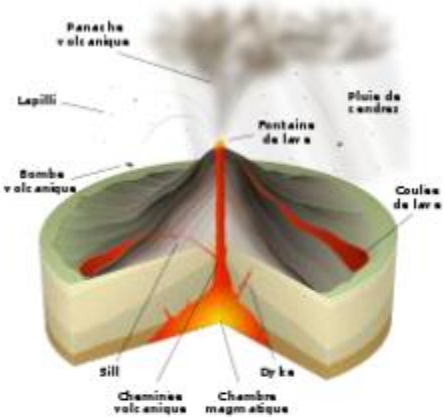
Violente Explosion (entendue / 150 km!)
Niveau 6 échelle d'explosivité volcanique (VEI)
Nuée ardente
Collapse de caldera
tsunami

C'est quoi une collapse de caldera??

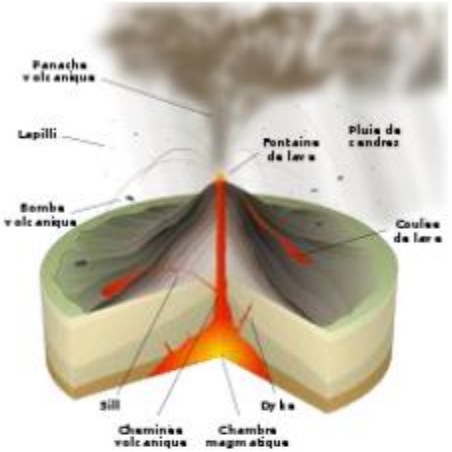
Différents contextes géodynamiques et donc différents types de volcanisme



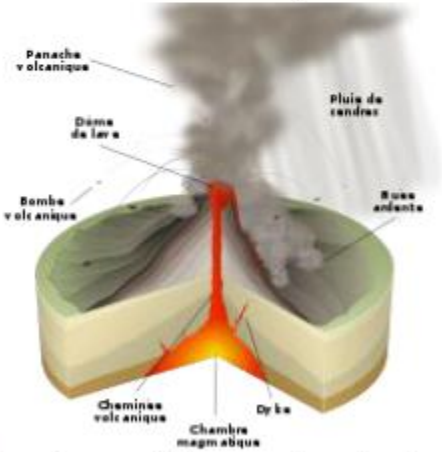
Eruption Hawaïenne
(laves très fluides,
Lac de laves)



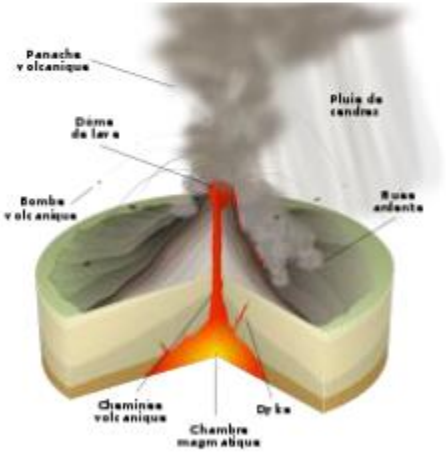
Eruption Strombolienne
(coulées, bombes, scories, cendres)



Eruption Vulcanienne (explosive)
(laves basaltiques fluides, coulées
pierre ponce, cendres, bombes)



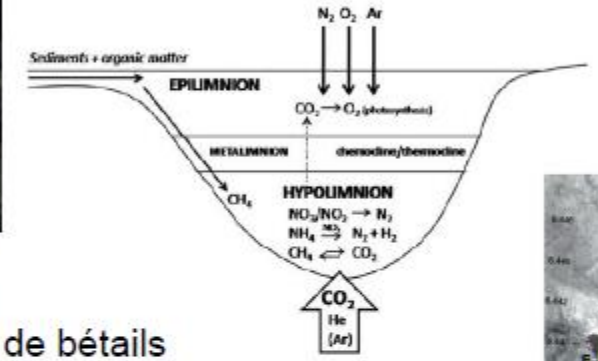
Eruption péléenne (explosive)
(lave pâteuse, dôme de lave,
gaz et cendres) ex Vésuve



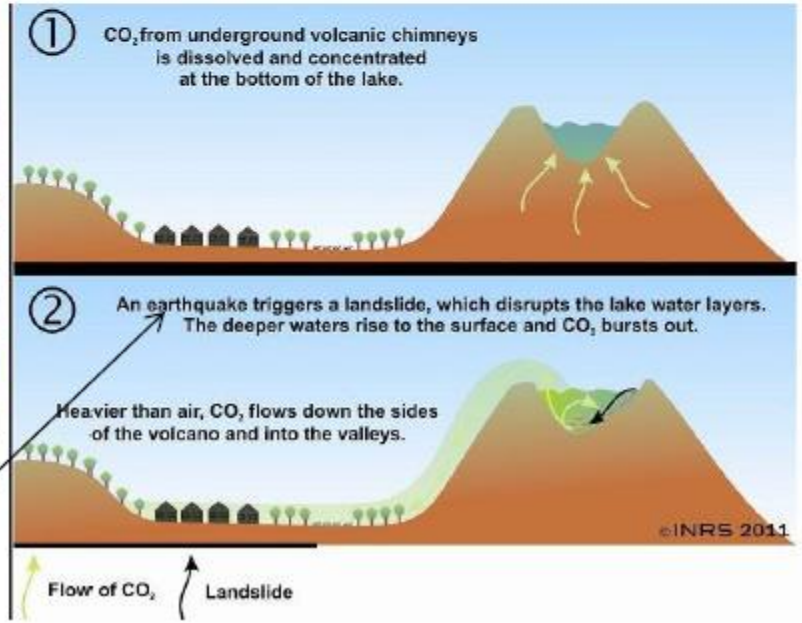
Eruption plinienne (explosive)
(gaz, explosion, cendres)

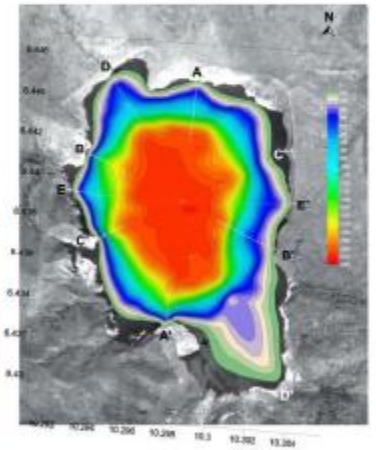
Eruption phréato magmatique
(laves+eau= explosion
+ cendres, ponces, bombes)

Nyos, Albano & Pavin: 3 cratères de lac méro-mictiques exposés à des éruptions limniques d'intensités variables

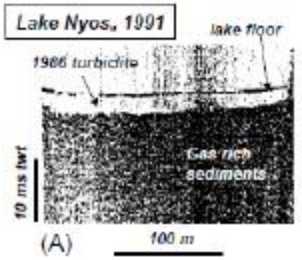


L'éruption limnique du lac Nyos (Aout 1986):1834 morts
& 3500 tètes de bétails

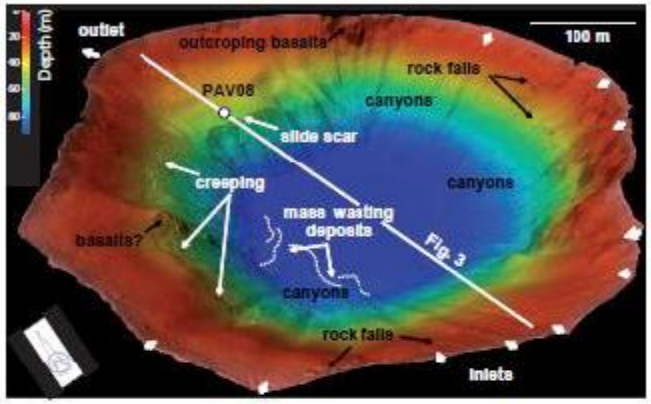




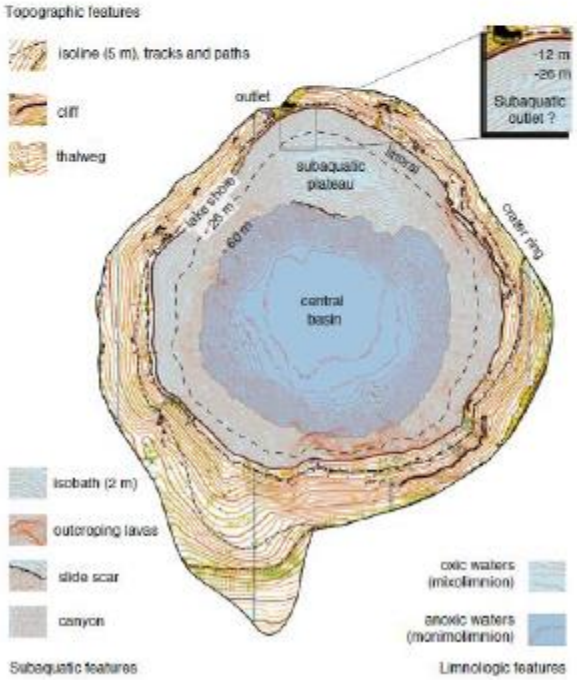
Lake Nyos
Bathymétrie 2003

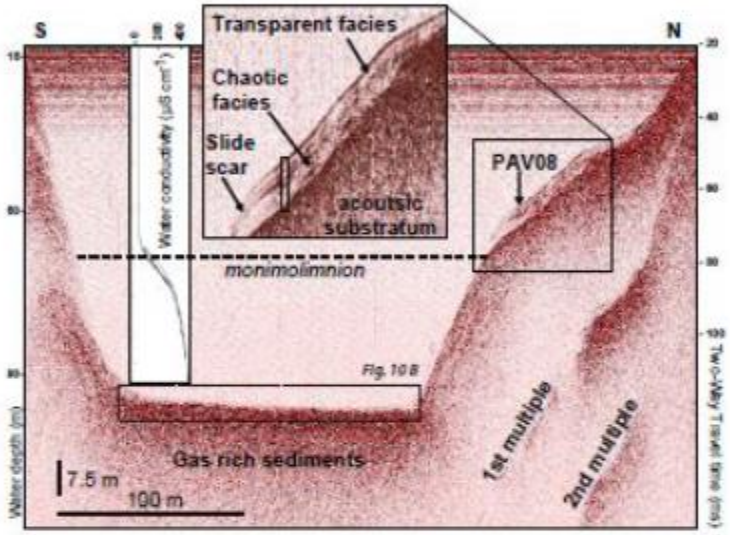


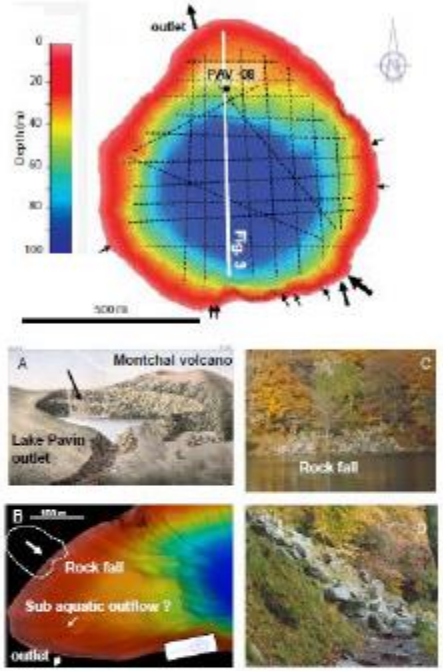
Les éruptions limniques récentes du Pavin ?

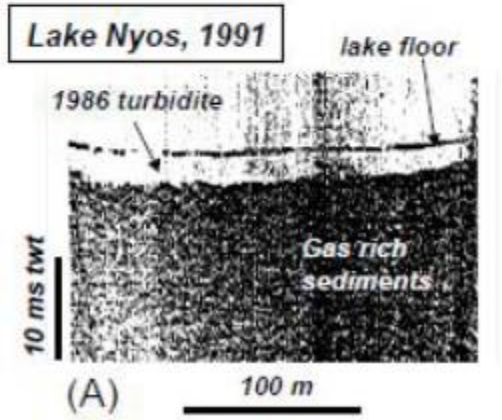


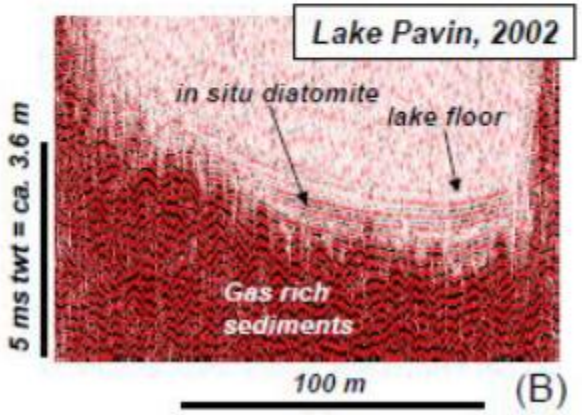
Lake Pavin crater geomorphology



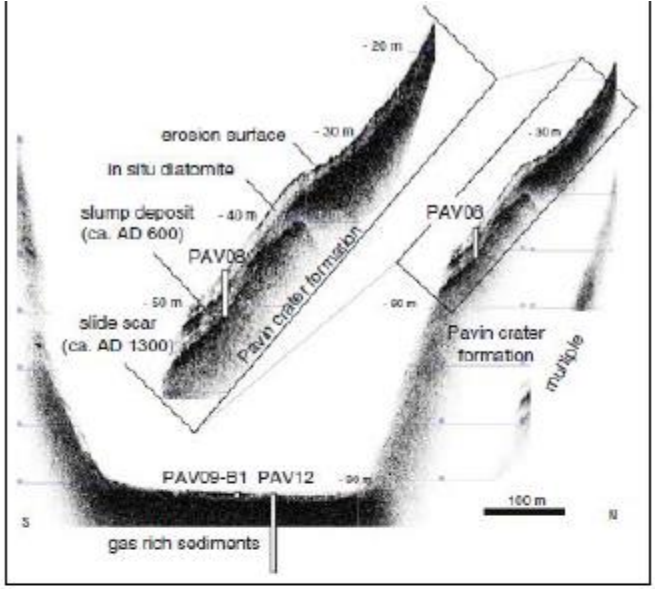


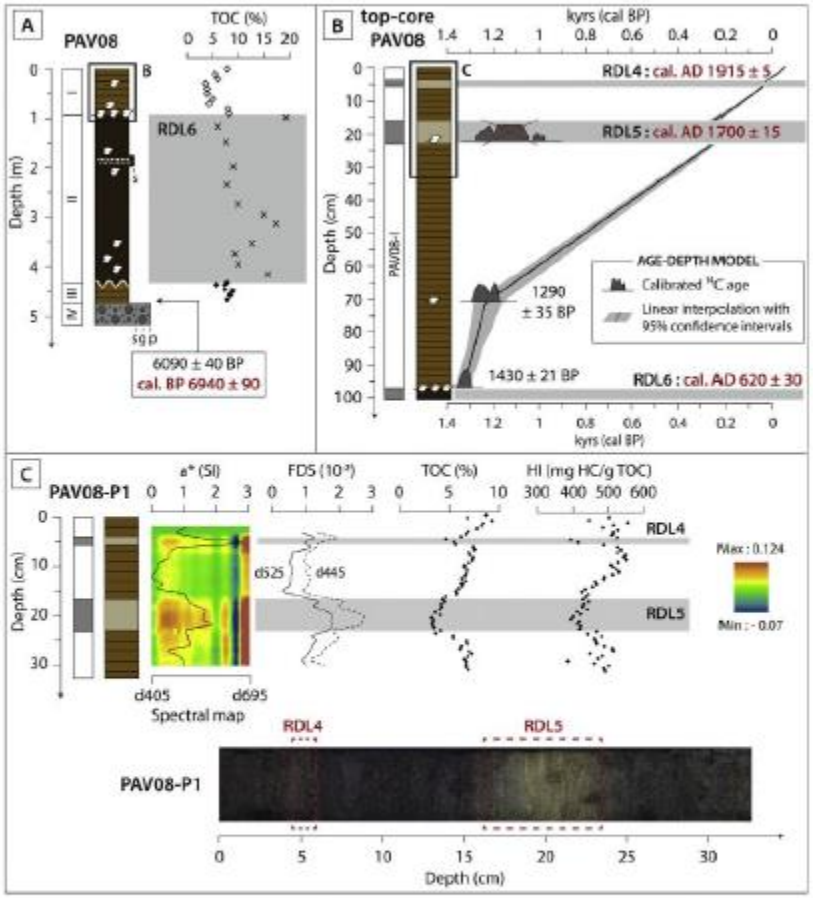


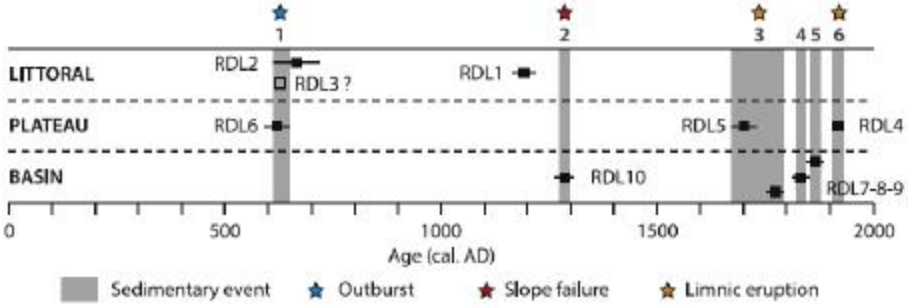


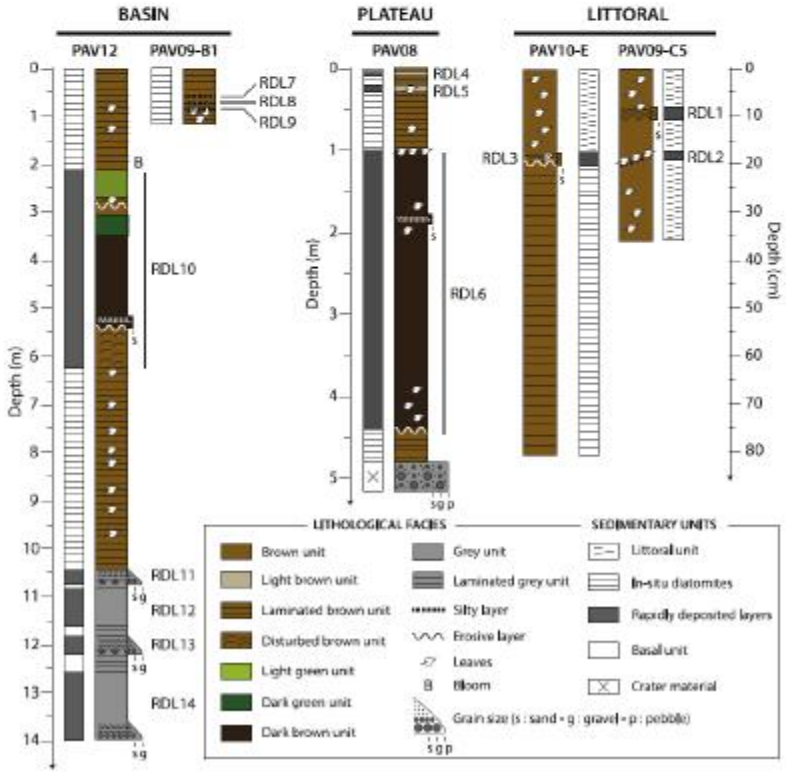


Des dépôts oxydés au Pavin contemporains de « descriptions » historiques…d'éruptions mineures?





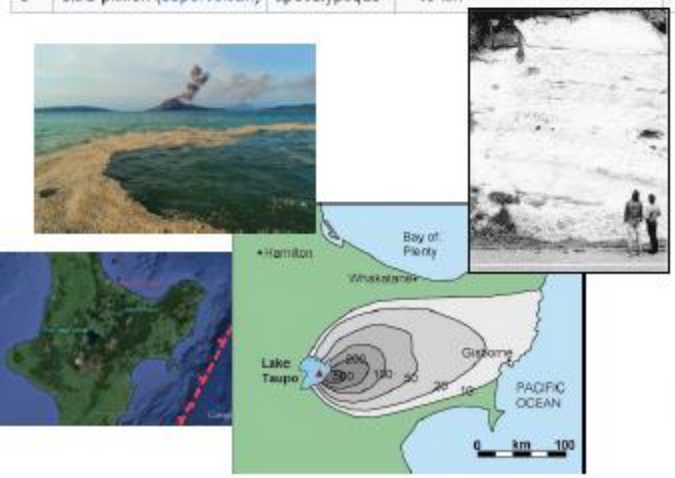


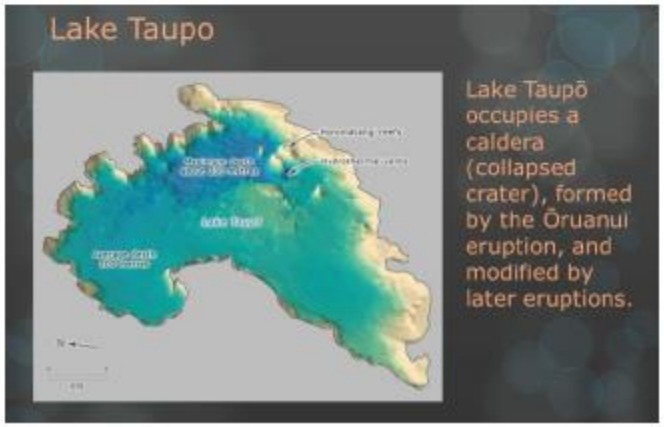


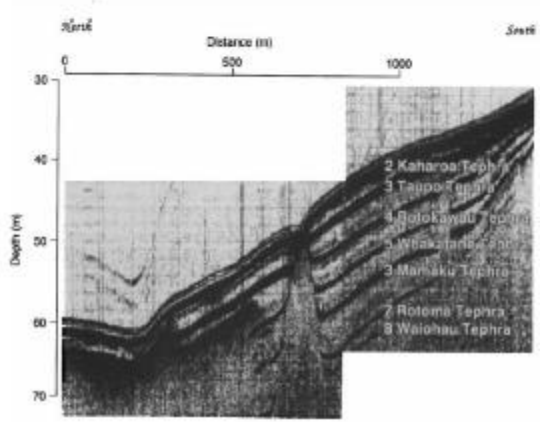
4) Impact planétaire des grosses éruptions volcaniques

Volcanic Eruption Index (VEI): calcul du volume de matière associées à une éruption… (approximatif, ordre de grandeur)

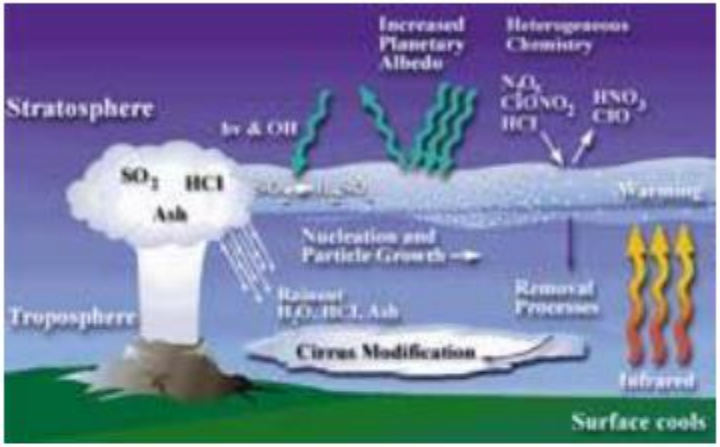
VEI	Classification	Description	Hauteur du nuage de cendres	Volume éjecté	Fréquence d'éruptions	Exemple	Nombre d'éruptions historiques
0	Hawaïen	non explosif	< 100 m	> 1 000 m^3	quotidien	Kilauea	-
1	Hawaïen / Strombolien	modéré	100-1 000 m	> 10 000 m^3	quotidien	Stromboli	-
2	Strombolien / Vulcanien	explosif	1-5 km	> 1 000 000 m^3	hebdomadaire	Galeras, 1992	3631
3	Vulcanien	catastrophique	3-20 km	> 10 000 000 m^3	annuel	Nevado del Ruiz, 1985 ; Vulcano, 1888-1890	924
4	Vulcanien Plinien	cataclysmique	15-25 km	> 0,1 km^3	≥ 10 ans	Galunggung, 1982 ; Láscar, 1993	307
5	Plinien	paroxysmique	> 25 km	> 1 km^3	≥ 50 ans	Vésuve, 79 ; Mont Saint Helens, 1980	106
6	Plinien / Ultra-plinien	colossal	> 30 km	> 10 km^3	≥ 100 ans	Krakatoa, 1883 ; Pinatubo, 1991 ; Novarupta, 1912	46
7	Ultra-plinien	méga-colossal	> 35 km	> 100 km^3	≥ 1 000 ans	Mont Paektu, 946 ; Samalas, 1257 ; Tambora, 1815 ; Santorin, 1600 av. J.-C.	4
8	Ultra-plinien (supervolcan)	apocalyptique	> 40 km	> 1 000 km^3	≥ 10 000 ans	Lac Taupo, 26 500 ans ; Toba, 74 000 ans ; Yellowstone, 600 000 ans	0

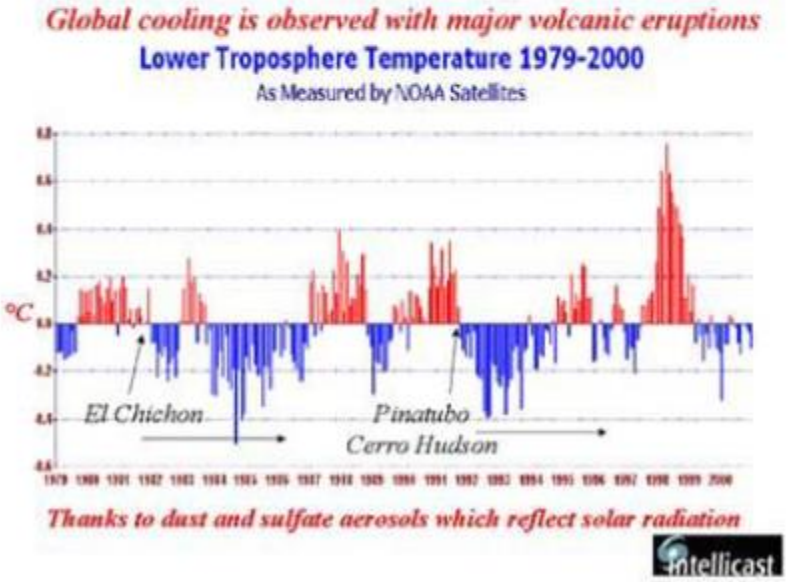






Les particules volcaniques peuvent atteindre la haute atmosphère & changer les conditions climatiques (combien de temps?)





Date	Lieu	VEI
-760 000 ans	Long Valley	8
-640 000 ans	Yellowstone	8
-73 000 ans	Toba	8
-12 900 ans	Lac de Laach	6-7
-1640	Santorin	7
79	Vésuve	5-6
181, 186 ou vers 232	Taupo	6-7
946	Mont Paektu	7
1257	Samalas	7
1783	Laki	4-5
1815	Tambora	7
1822	Galunggung	5
1883	Krakatoa	6
1902	Pelée	4
1902	Santa Maria	6
1912	Novarupta (Katmai)	6
1913	Colima	5
1932	Quizapu	5
1933	Kharimkotan	5
1951	Lamington	4
1956	Bezymianny	5
1963	Mont Agung	5
1980	Mont Saint Helens	5
1982	El Chichón	5
1985	Nevado del Ruiz	3
1991	Pinatubo	6
2010	Eyjafjöll	4
2011	Grímsvötn	4

SCIENTIFIC REPORTS

OPEN

The 1257 Samalas eruption (Lombok, Indonesia): the single greatest stratospheric gas release of the Common Era

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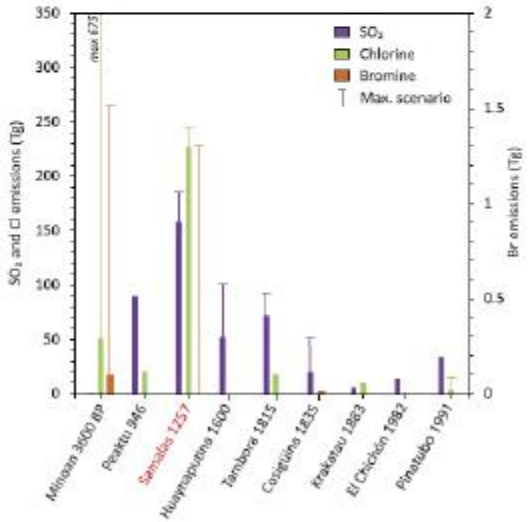
Céline M. Vidal[1], Nicole Métrich[1], Jean-Christophe Komorowski[1], Indyo Pratomo[2], Agnès Michel[1], Nugraha Kartadinata[3], Vincent Robert[4] & Franck Lavigne[5]

Archives historiques



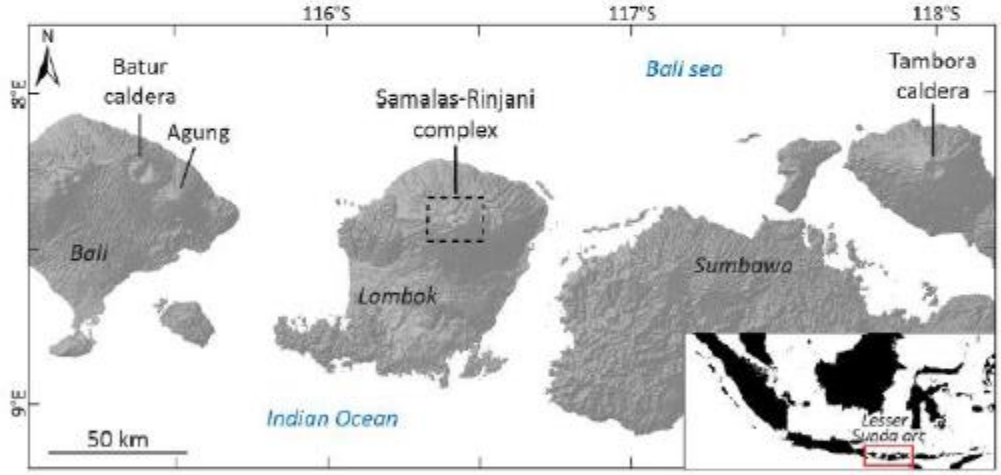


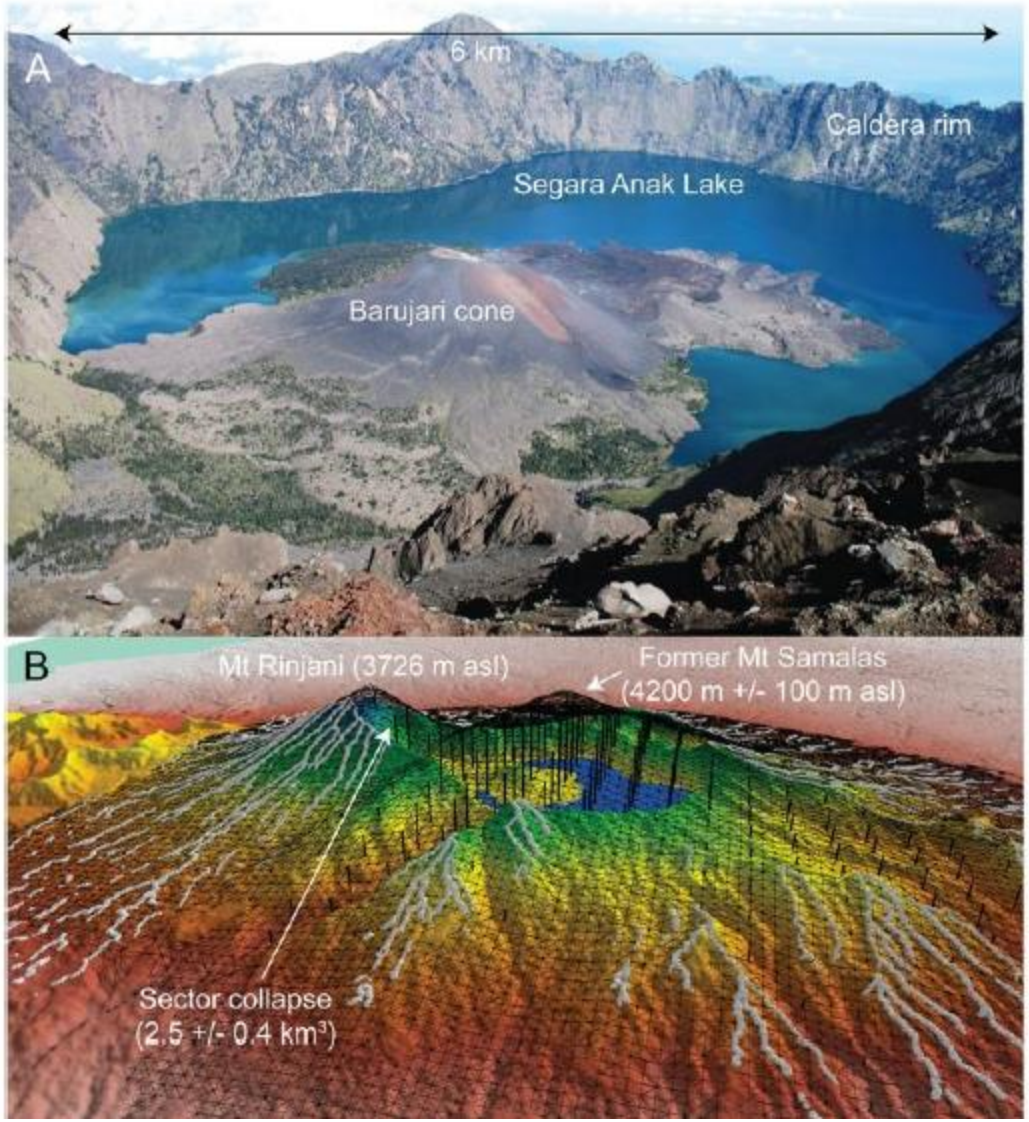
Figure 5. The 1257 Samalas eruption produced the largest volatile emissions of the Common Era. Plots of SO_2, Cl and Br emissions (in Tg, i.e. megatons) for climate-impacting plinian eruptions. Yields of eruptions before 1980 are from petrological studies. Fine lines represent the maximum estimates (associated with the contribution of the parent basaltic magma in the case of the 1257 eruption). References: Minoan 3,600 y B.P. (Greece)[37]; Peaktu 946 A.D. (DPRK/China)[36]; Huaynaputina 1600 (Peru)[66]; Tambora 1815 (Indonesia), emissions re-calculated at 36–45 Tg S (73–91 Tg SO_2) and 18–23 Tg Cl based on the syn-eruptive losses (400 ppm S; 200 ppm Cl)[53,67] and new volume estimates of 41 ± 4 km^3 DRE[68] and 51 km^3 DRE[69]); Cosigüina 1835 (Nicaragua)[50,70]; Krakatau 1883 (Indonesia)[71]; El Chichón 1982 (Mexico)[72]; Pinatubo 1991 (Philippines)[4].

DISASTERS

The Medieval Volcanic Eruption That Triggered a Year Without Summer

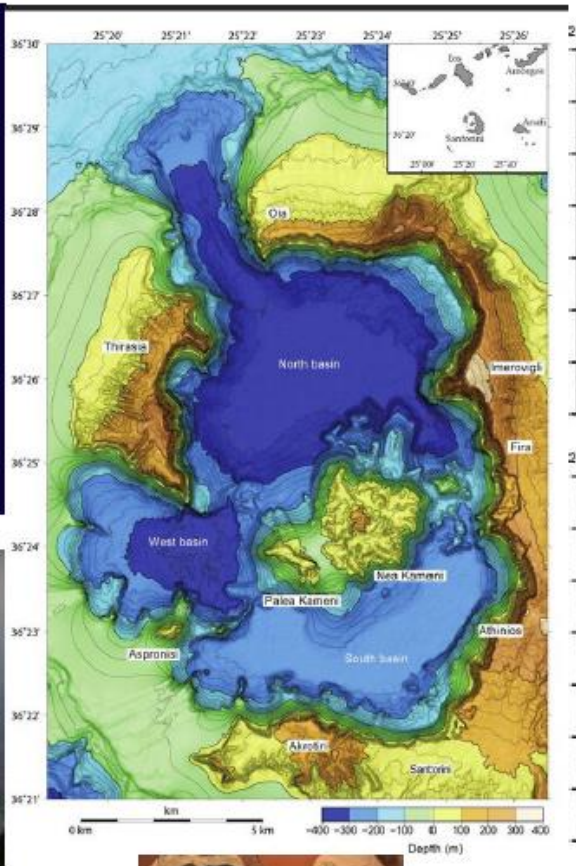
Ancient chronicles told of an unusually cold summer in the year of 1258. Now researchers have found the volcanic eruption that temporarily changed the planet's climate.

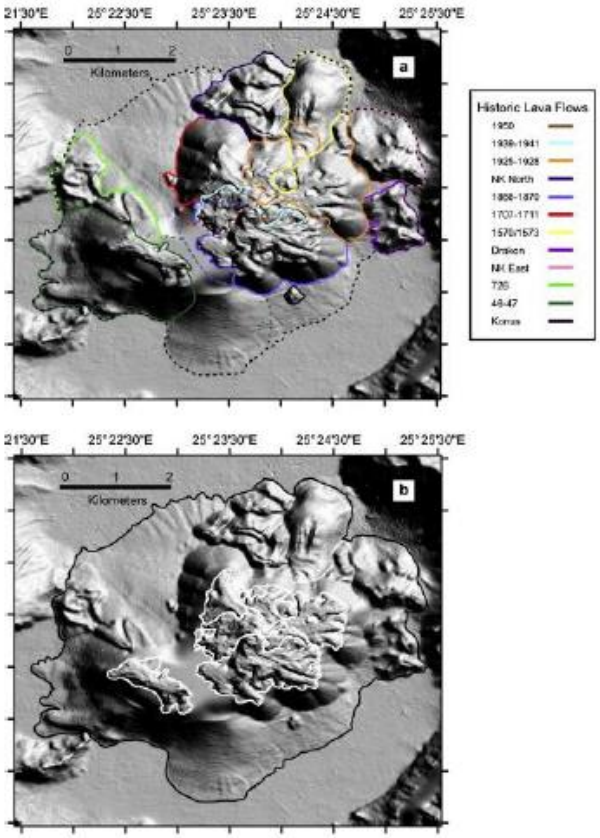
L'histoire de la caldera de Samals déduite de sa géomorphologie!



La caldera de Santorin (Grèce)

Comment Santorin c'est il formé & quel a été son impact?



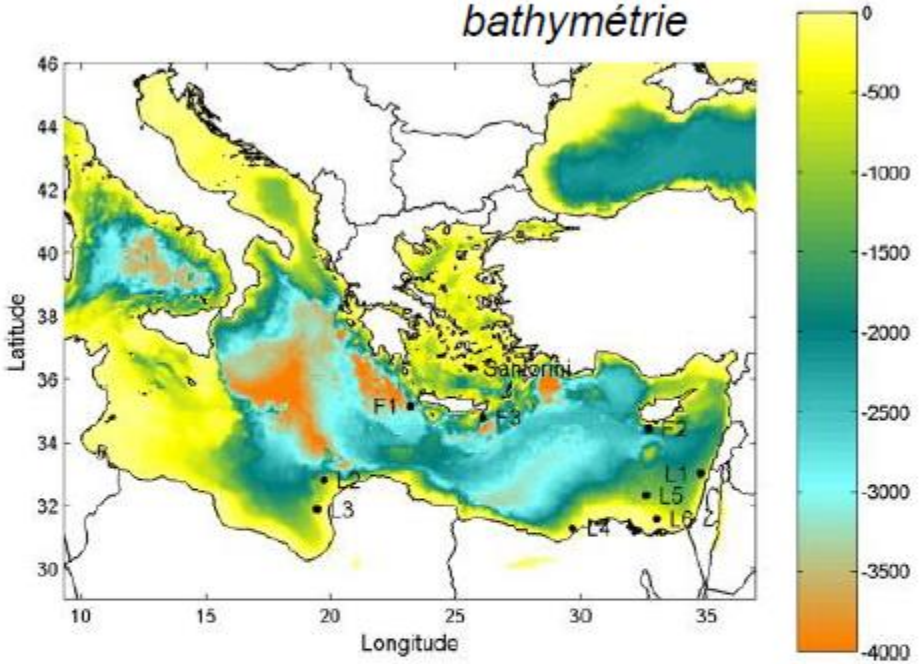


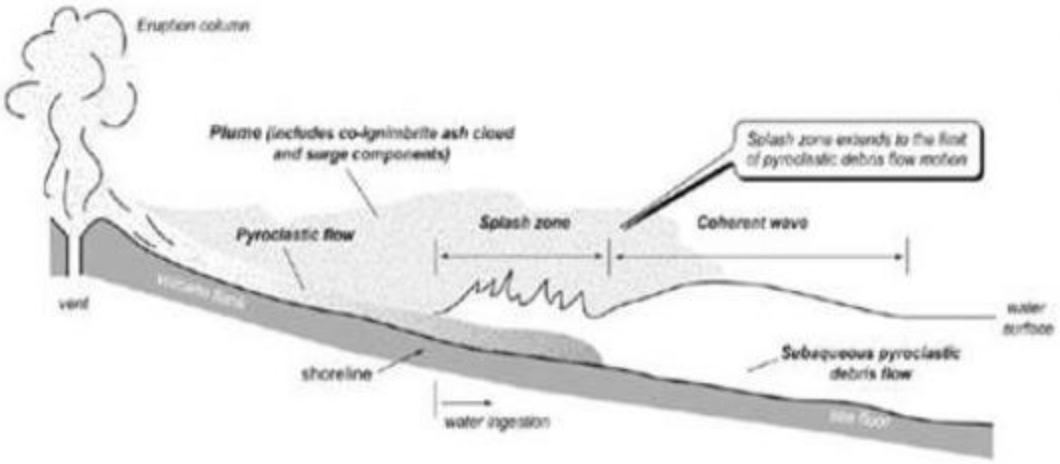
Cet évènement est associé à la fin de la civilisation Mionienne (Age du Bronze)

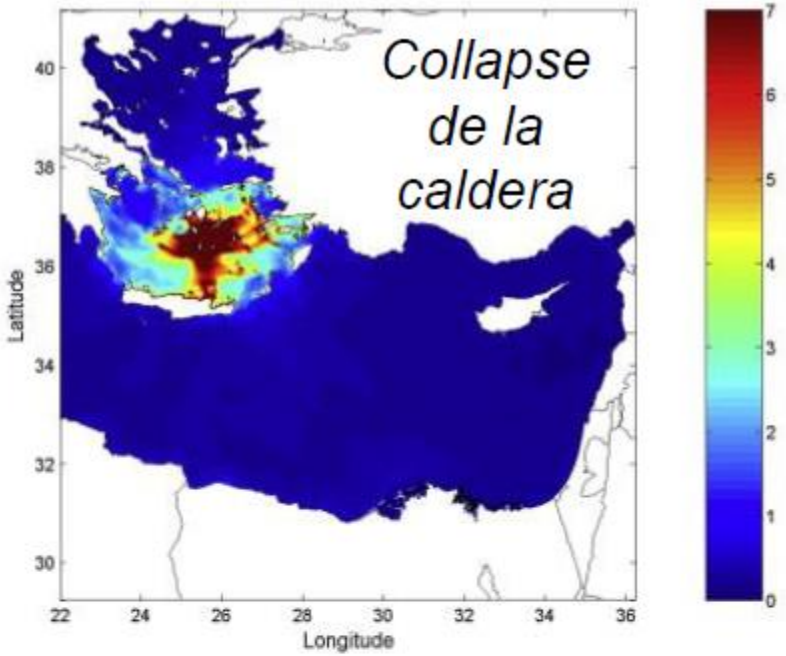
Ce volcan est toujours actif et en reconstruction

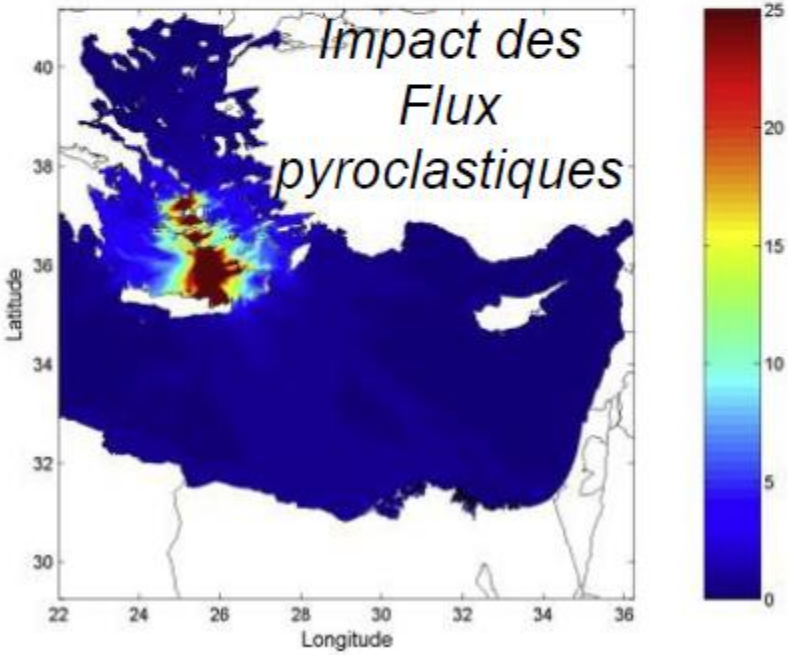
Modélisation de tsunami

bathymétrie

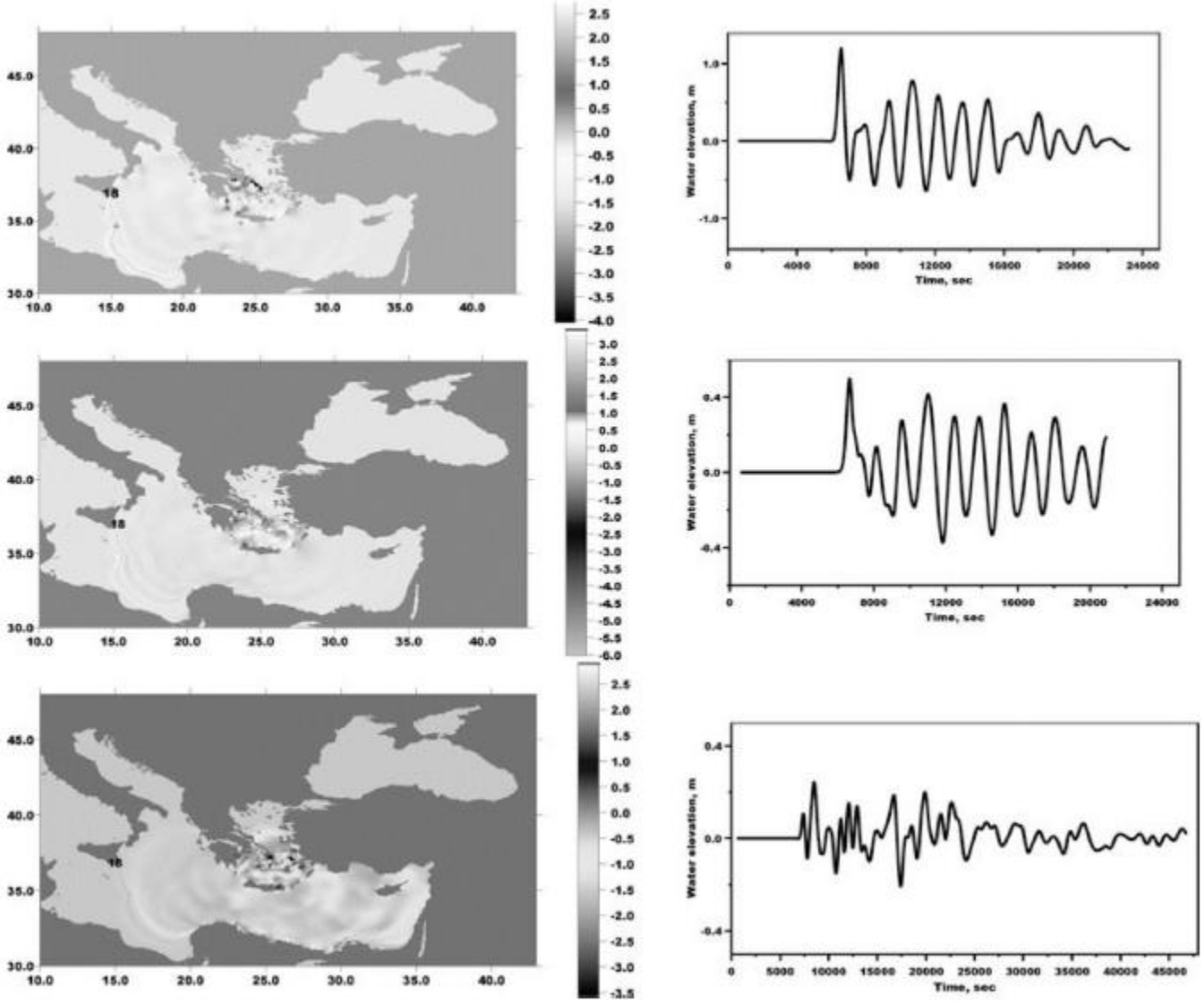






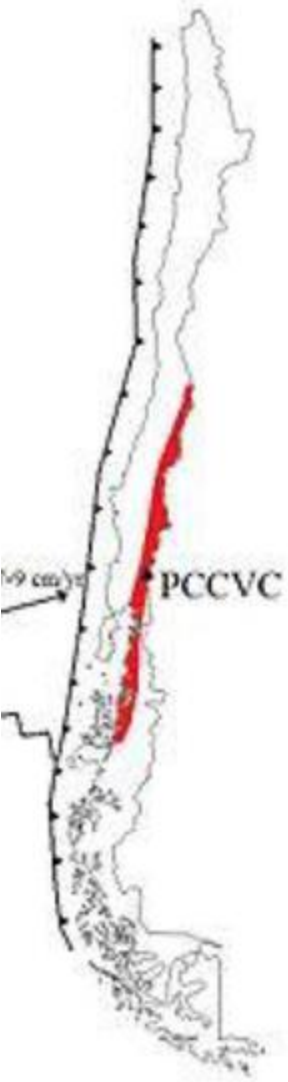


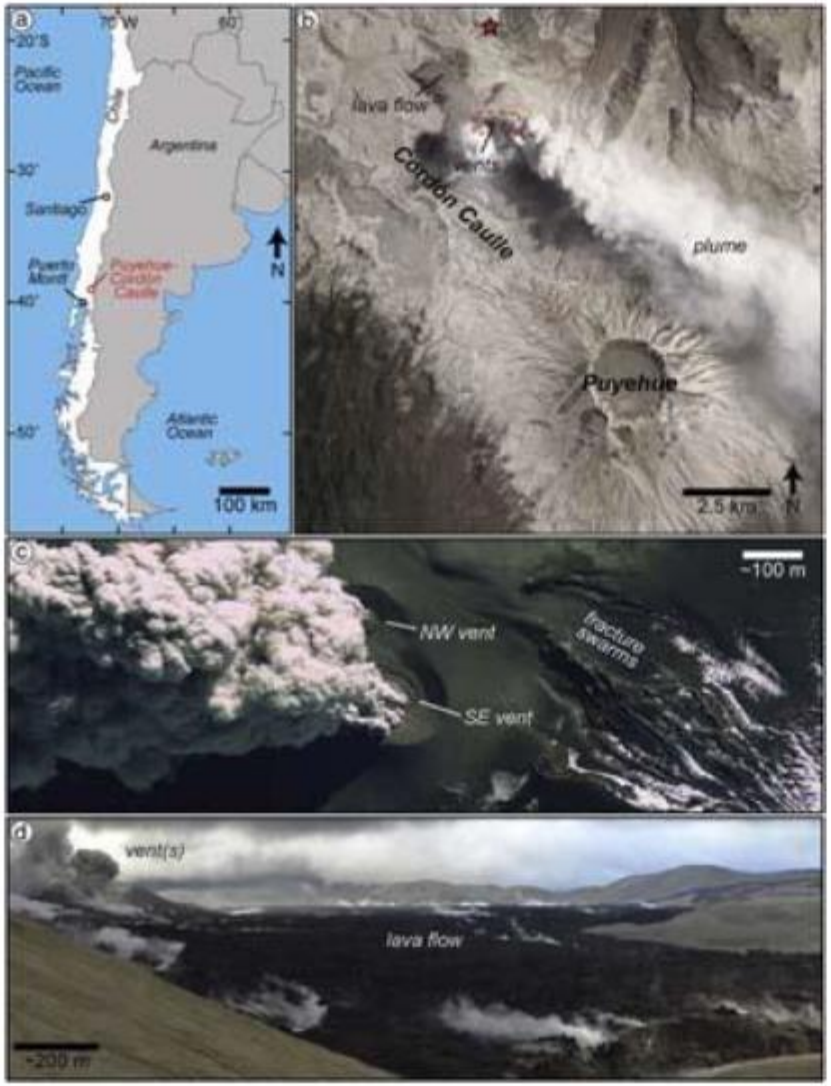
Modélisation du tsunami de Santorin



Impact sur les cotes méditerranéennes

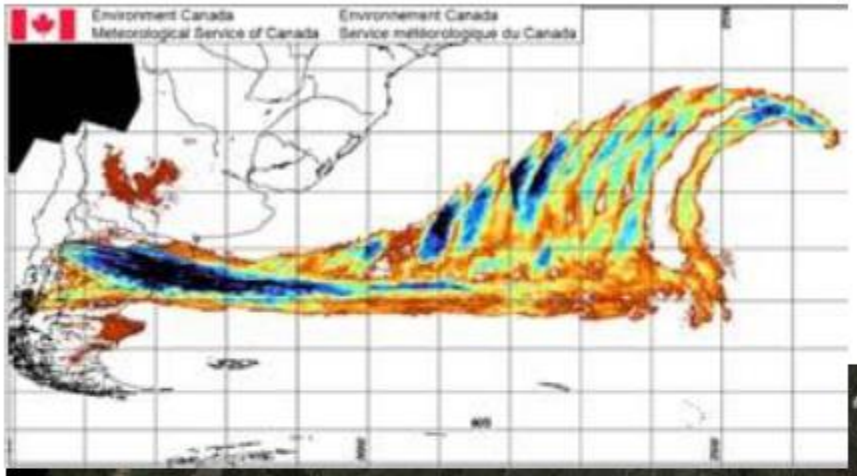
6) Suivit d'une éruption et d'un volcan au Sud du Chili (volcan Puyehue, 2011)

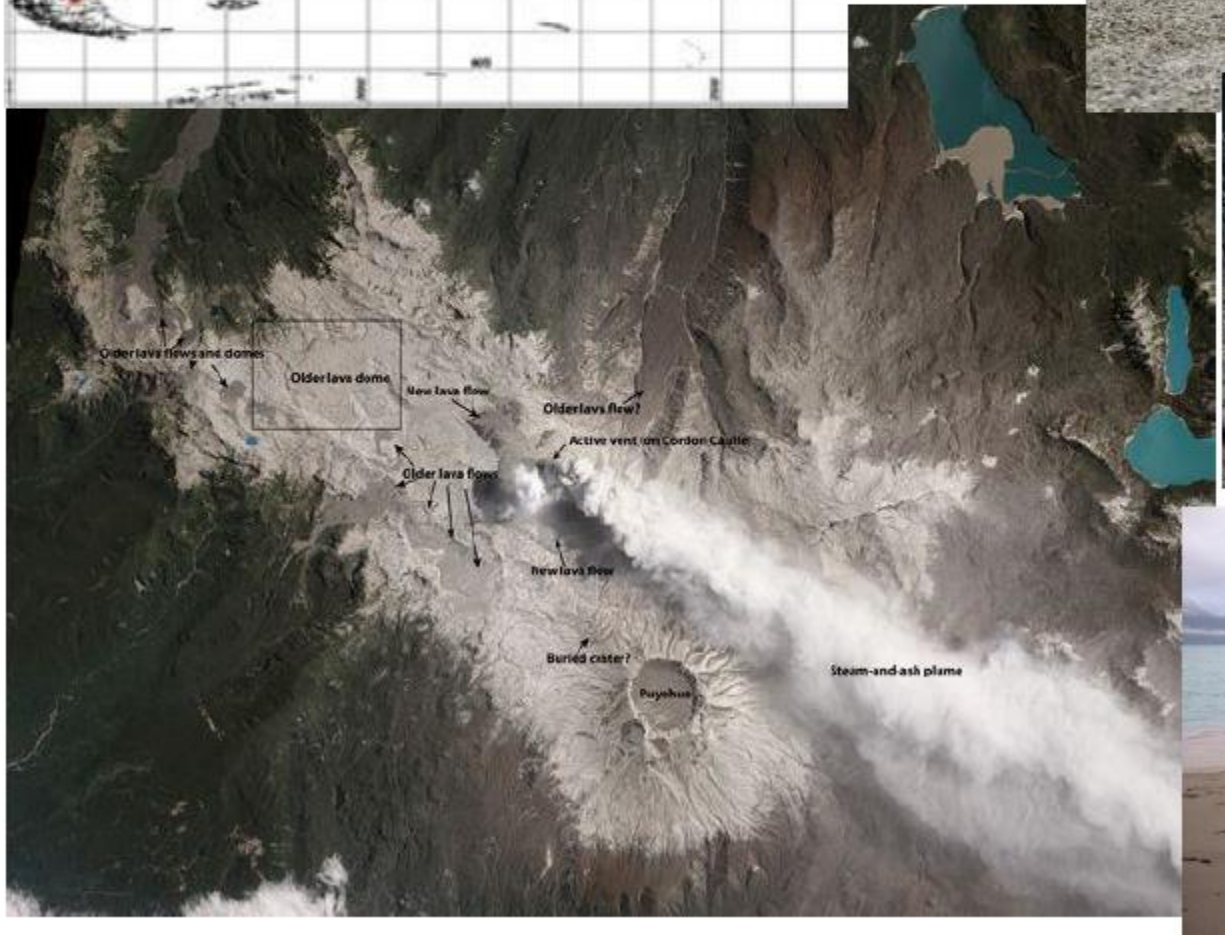




Volcan Puyehue Mai 1960

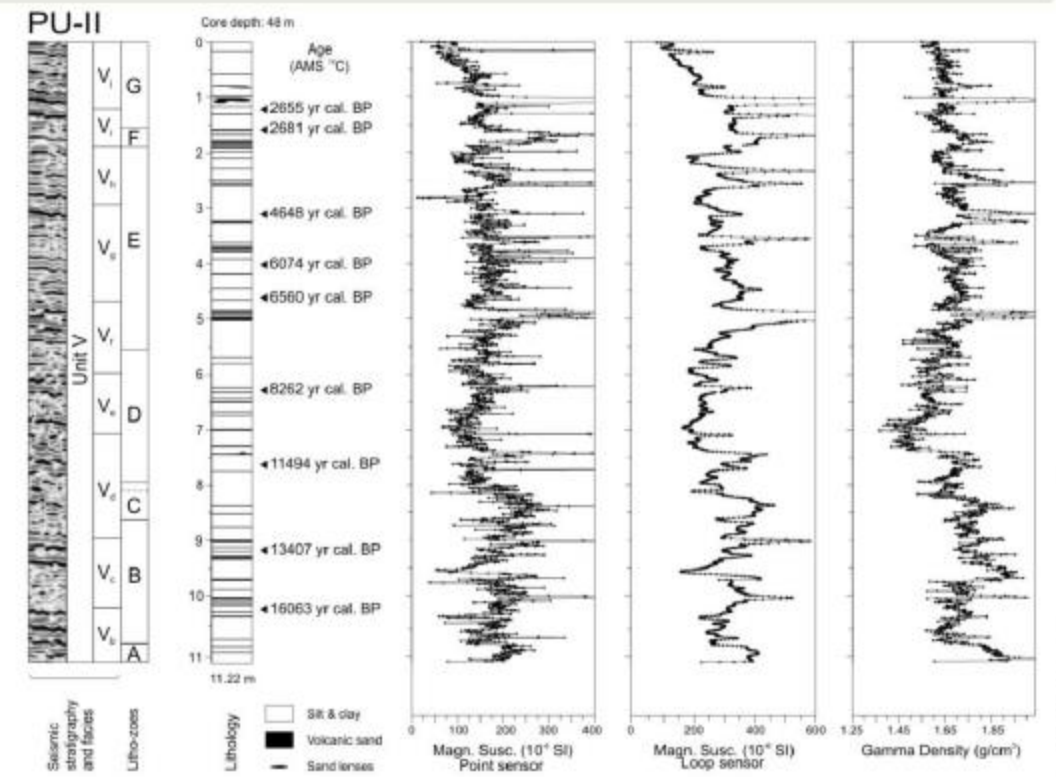
Volcan Puyehue, éruption 2011

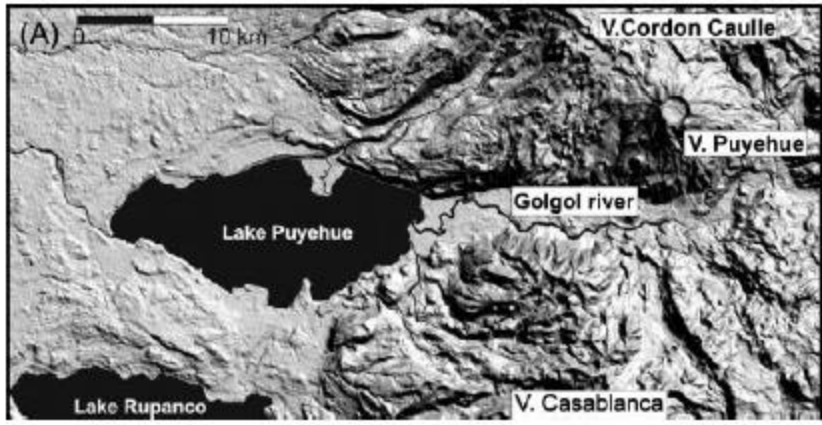


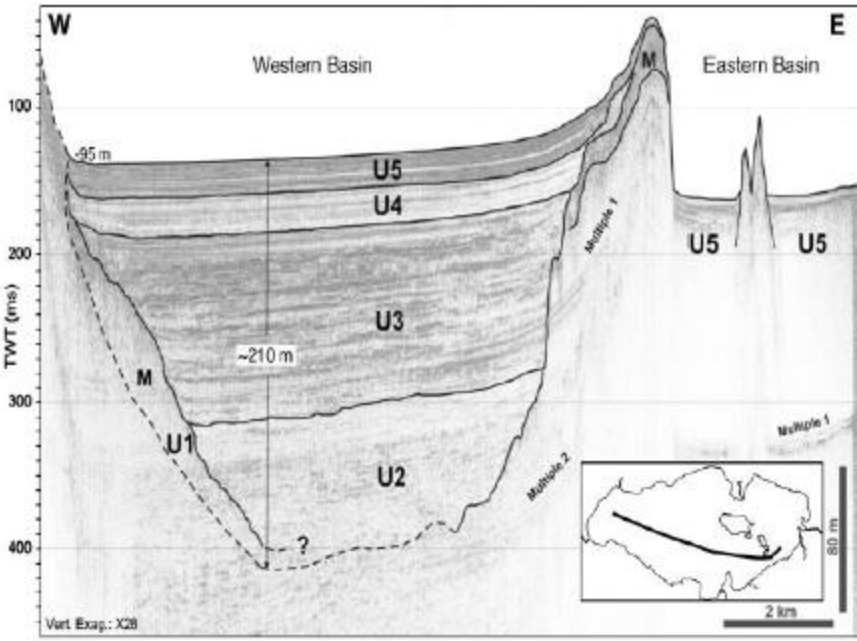


La tephro stratigraphie dans les lacs : potentiels et limites…

Retombées & remobilisation de produits volcaniques (Lac Puyehue, Chili)







Etude réalisée entre AD 2000-2008….