Meteorits

INTRODUCCIÓ, RECONEIXEMENT I RECERCA

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David Allepuz i Sunyé

Meteorits.cat

Cazameteoritos.es

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Javier Álvarez – Carlos Alonso – Alexia Sempere – Tonino Licciardello – Emilio Gilabert – Josep M.Bosch – Francisco Galvez – José A. Sánchez

INTRODUCCIÓ ALS METEORITS


E.F. Chladni

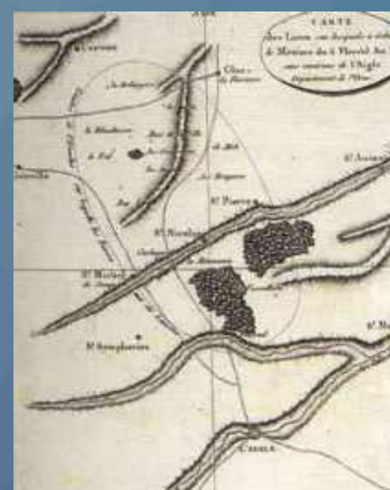

Ueber den
Ursprung
der von Pallas gefundenen
und anderer ihr ähnlicher
Eisenmassen,
und über einige damit in Verbindung stehende
Naturerscheinungen
von
Ernst Florens Friedrich Chladni,
Riga,
bey Johann Friedrich Hartknoch
1794.

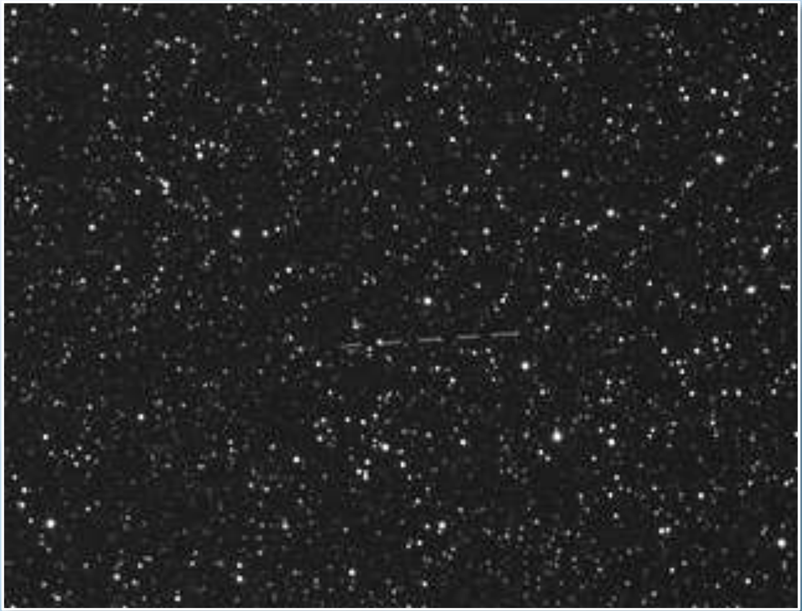
1794


Ueber
Feuer-Meteore,
und
über die mit denselben
herabgefallenen Massen,
von
Ernst Florens Friedrich Chladni,
Carl von Schreibers,
Wien 1819.

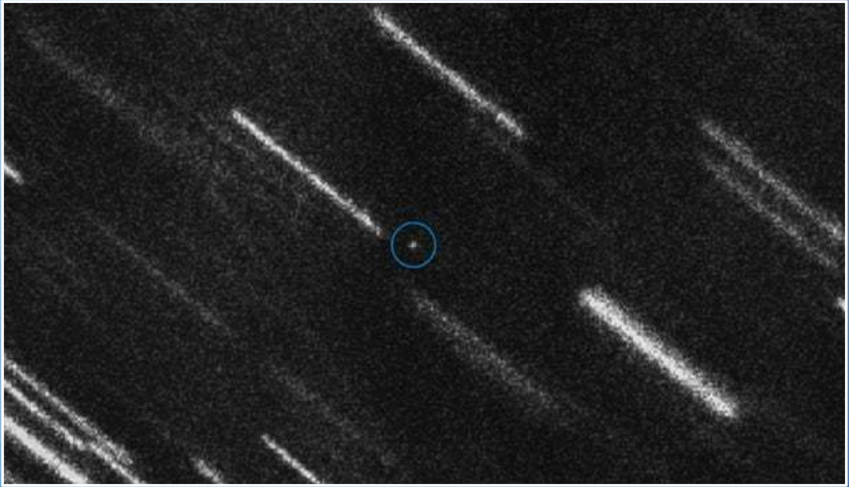
1819


J.B. Biot


L'Aigle, 1803



Meteoroide



Meteor (estel fugaç)

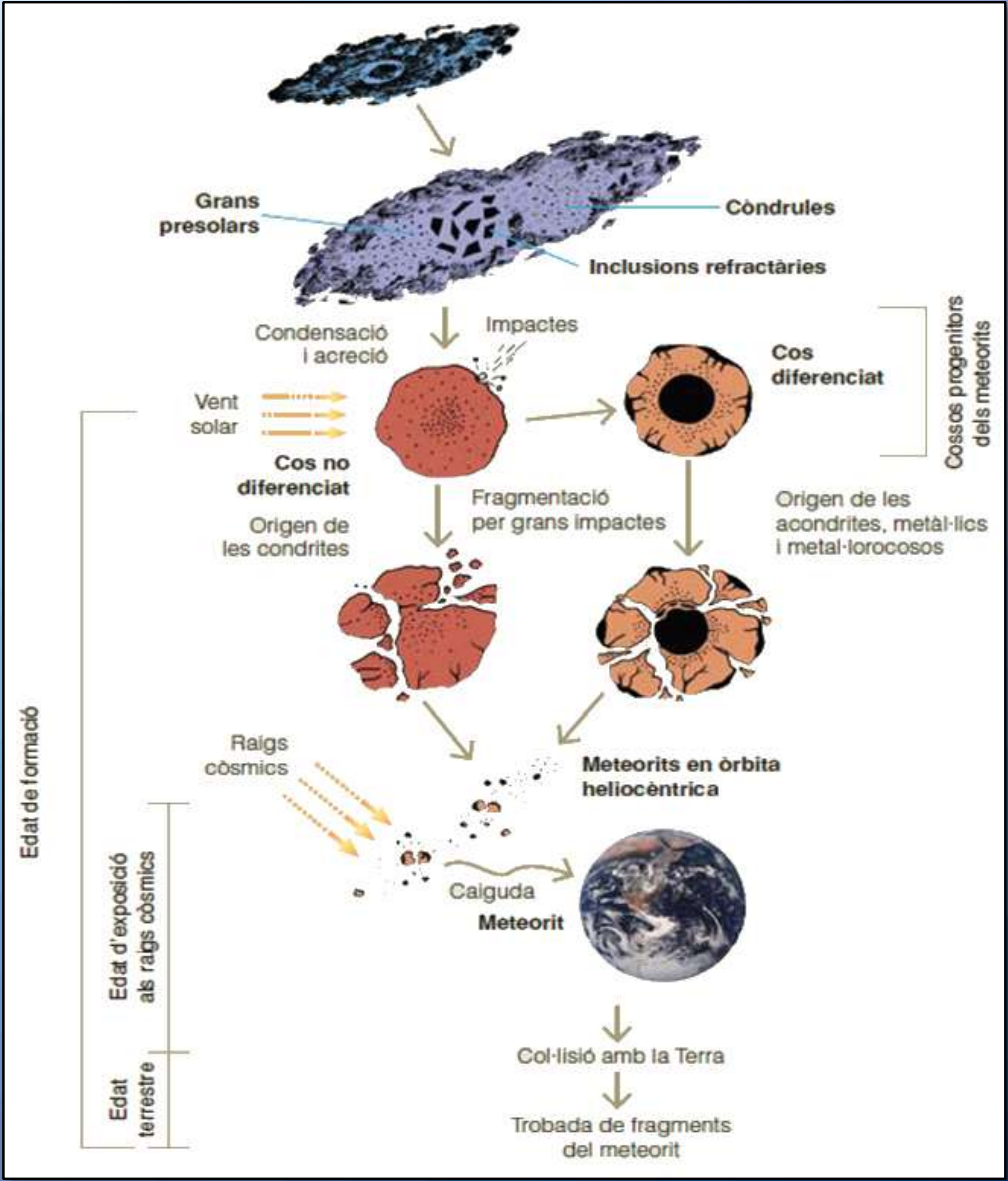
Bòlid

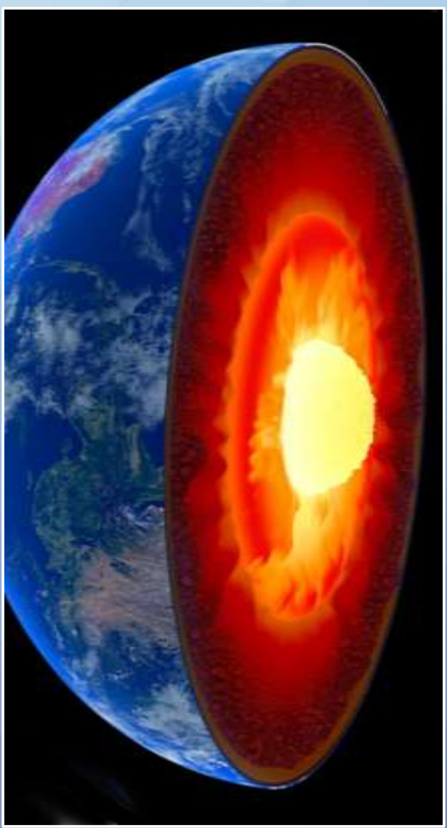
Meteorit

Les fàbriques de meteorits

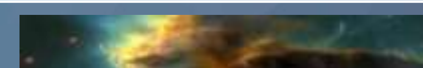
13.500 milions d'anys

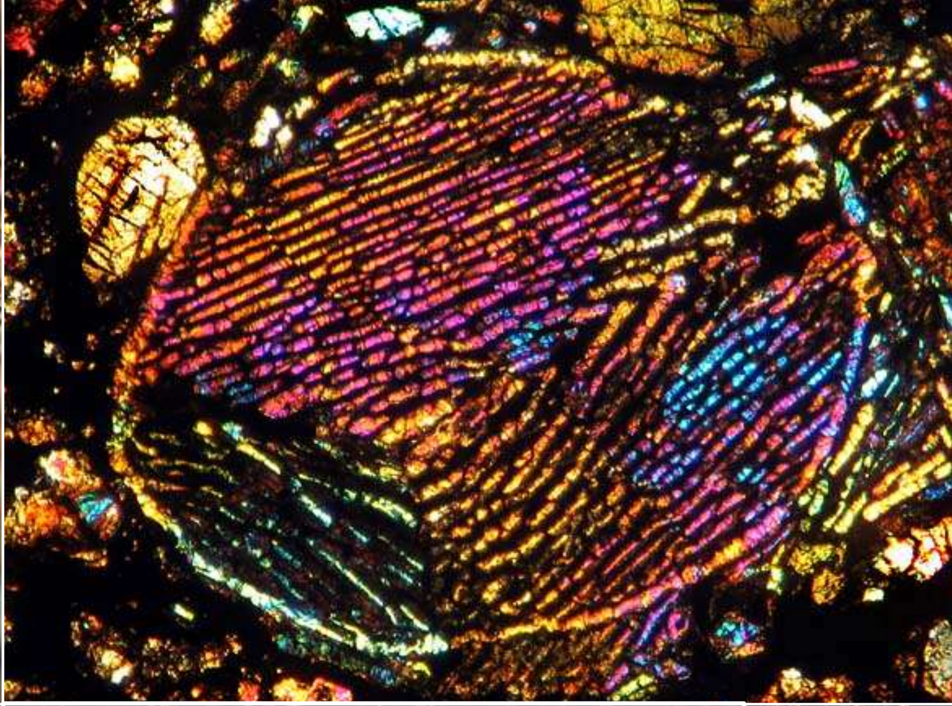
4.500 milions d'anys



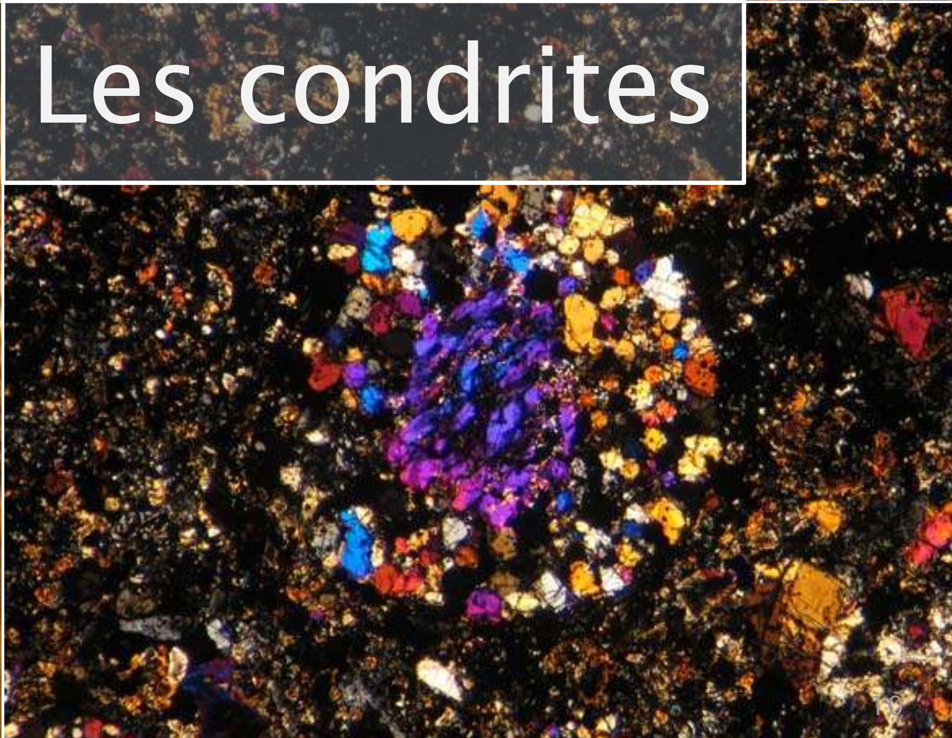


No diferenciats	Rocosos	Condrites	Ordinàries		H
					L
					LL
			Carbonàcies		CI
					CM
					CB
					CV
					CO
					CK
					CR
					CH
			Enstatítiques		EH
					EL
			Rumurutítiques		R
			Kakangari		K
Diferenciats		Acondrites	Primitives		Acapulcoites
					Lodranites
					Winonaites
			Planetàries	SNC	Shergottites
					Nakhlites
					Chassignites
					Basalt Breccia
					Ortopiroxenites
				Lunar	Impact Breccia
					Mare Basalt
			Asteroidals	HED	Howardites
					Eucrites
					Diogenites
				Angrites	
				Brachinites	
				Aubrites	
				Ureilites	
	Metàl·lics	Metal·lo Rocosos	Mesosiderites		
			Pallasites		Grup principal
					Eagle Station
					Piroxè
		Metàl·lics	Ataxites		
			Metàl·lics		

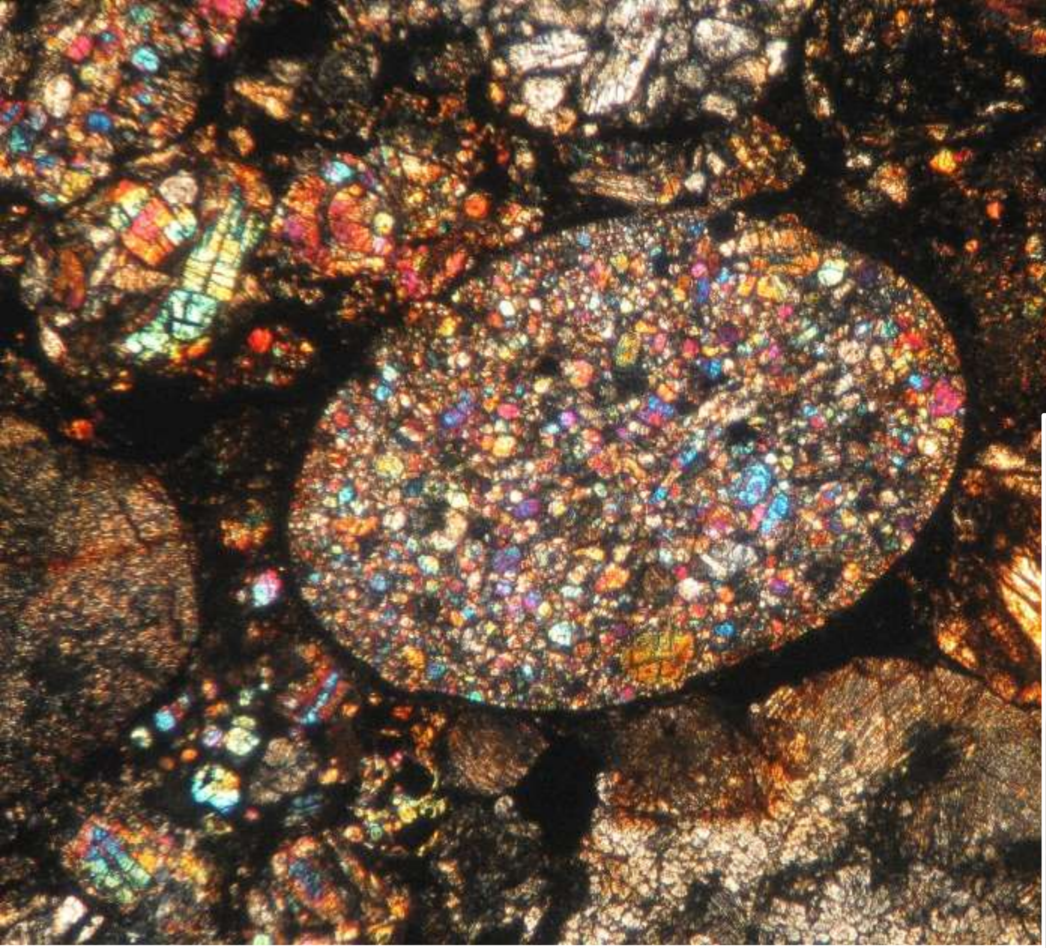


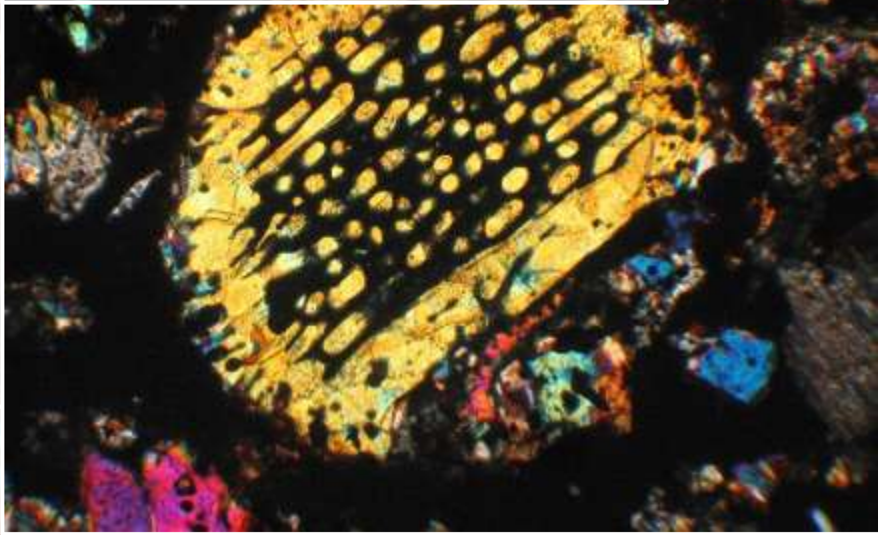


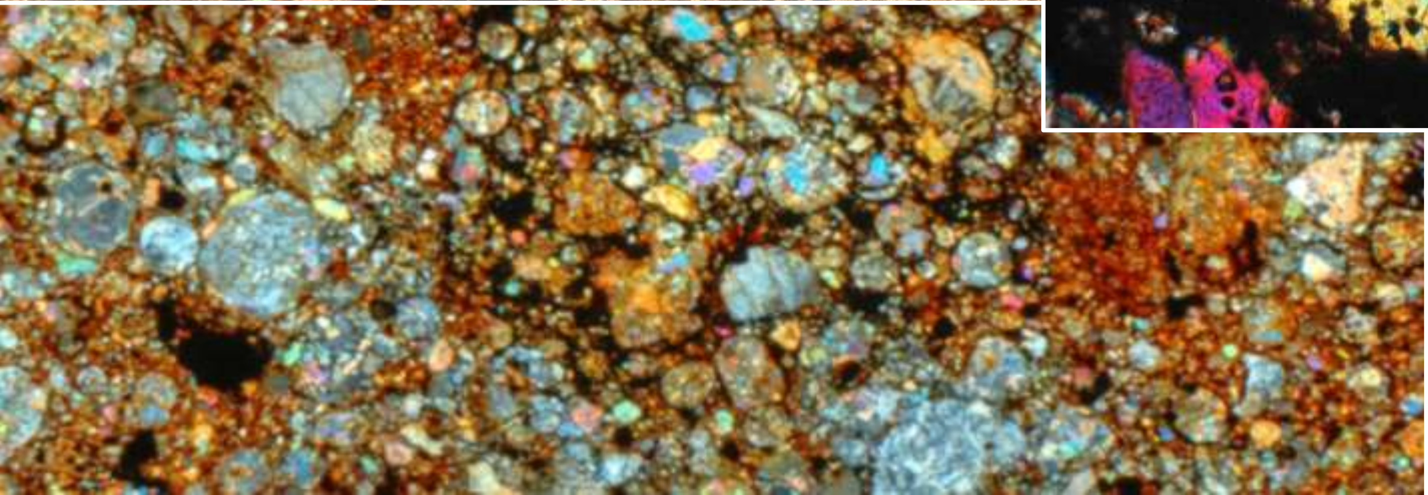
Les condrites

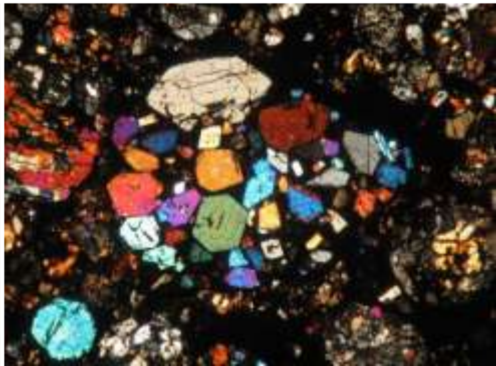


Les còndrules





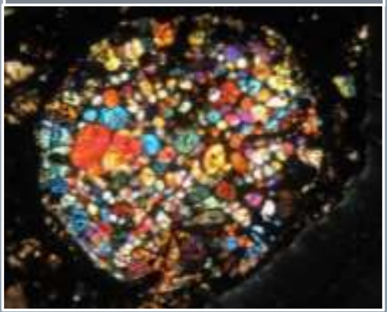




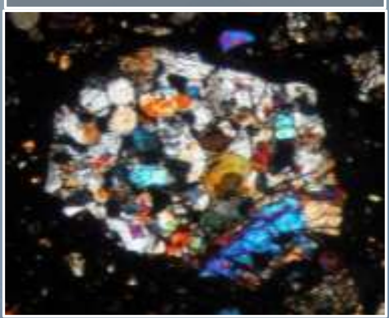
Porfirític

Tipus I – Reduït

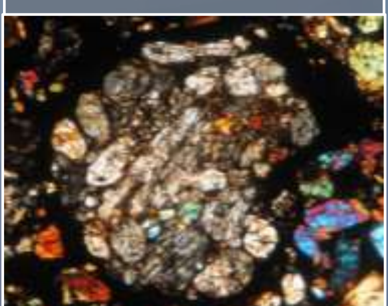
PO – Porfirític Oliví



POP – Porfirític Oliví Piroxè

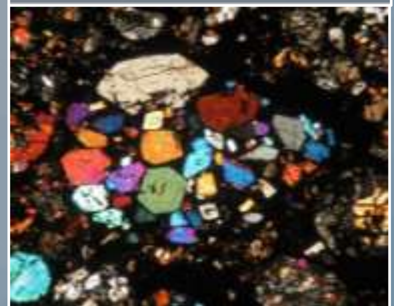


PP – Porfirític Piroxè



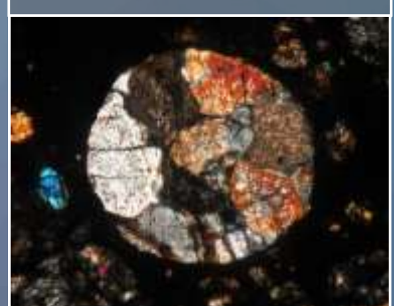
Tipus II – Oxidat

PO – Porfirític Oliví

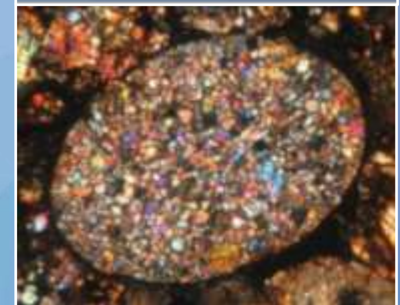


POP – Porfirític Oliví Piroxè

PP – Porfirític Piroxè

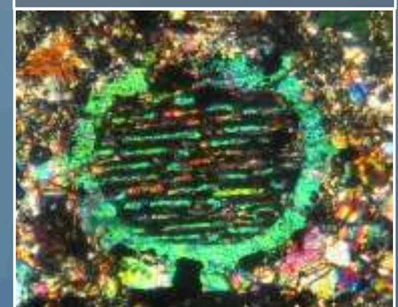


GOP – Granular Oliví Piroxè



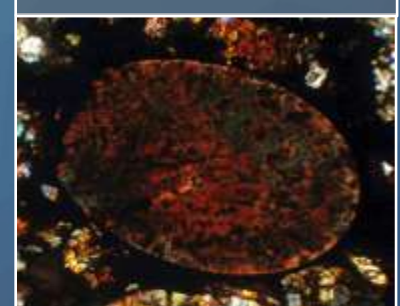
No Porfirític

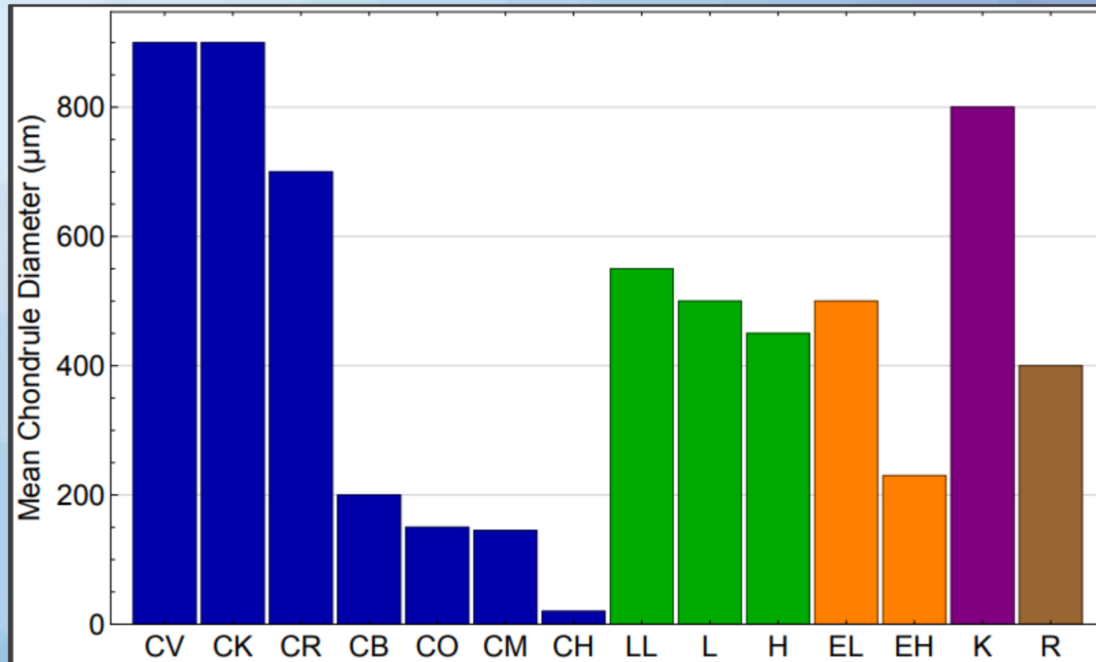
BO – Barrat Oliví



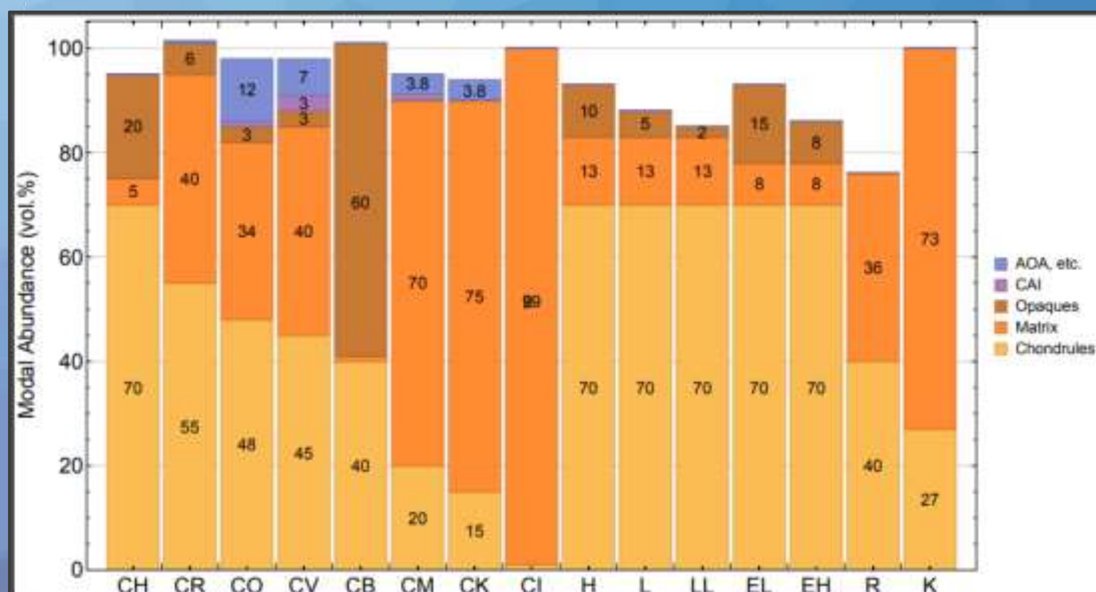
RP – Radial Piroxè

C – Criptocristal·lí





Mean Chondrule Diameter (μm)
0
200
400
600
800
CV
CK
CR
CB
CO
CM
CH
LL
L
H
EL
EH
K
R



Modal Abundance (vol.%)
0
20
40
60
80
100
CH
CR
CO
CV
CB
CM
CK
CI
H
L
LL
EL
EH
R
K
AOA, etc.
CAI
Opaques
Matrix
Chondrules

Tipologia petrològica

família	grup	1	2	3	4	5	6
		Alteració aquosa			Alteració tèrmica		
Ordinàries	H			H3	H4	H5	H6
	L			L3	L4	L5	L6
	LL			LL3	LL4	LL5	LL6
Carbonàcies	CI	CI1					
	CM	CM1	CM2				
	CV			CV3			
	CO			CO3			
	CK			CK3	CK4	CK5	CK6
	CR	CR1	CR2	CR3			
	CH			CH3			
Enstatítiques	EH			EH3	EH4	EH5	EH6
	EL			EL3		EL5	EL6
Rumurútiques	R			R3	R4		
Kakangari	K			K3			

temperatura màxima assolida						
<150	<200	400	600	700	800	950

Van Schmus & Wood (1967) adaptada per Allepuz segons model de McSween

1

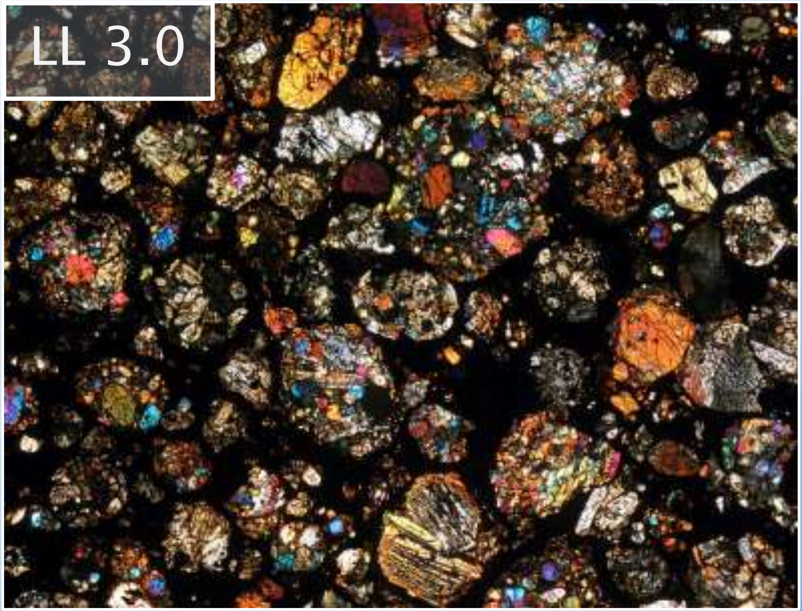
2

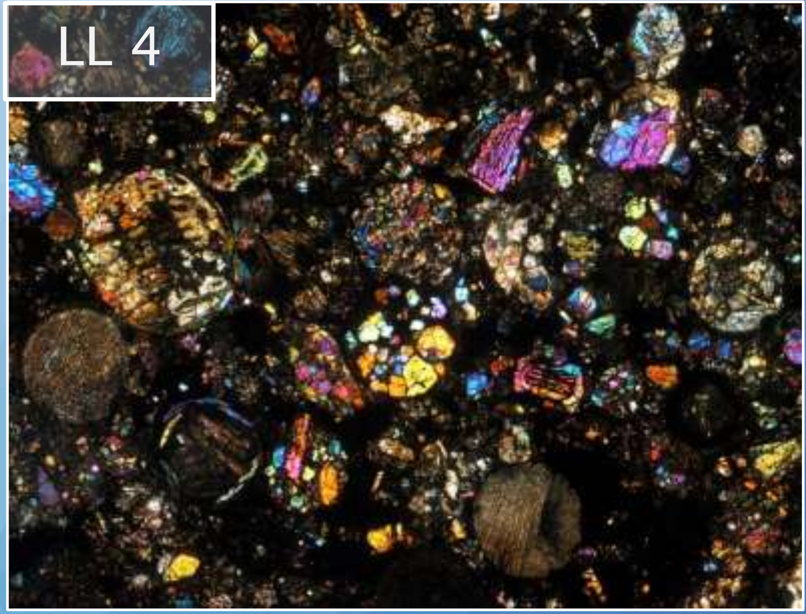
3

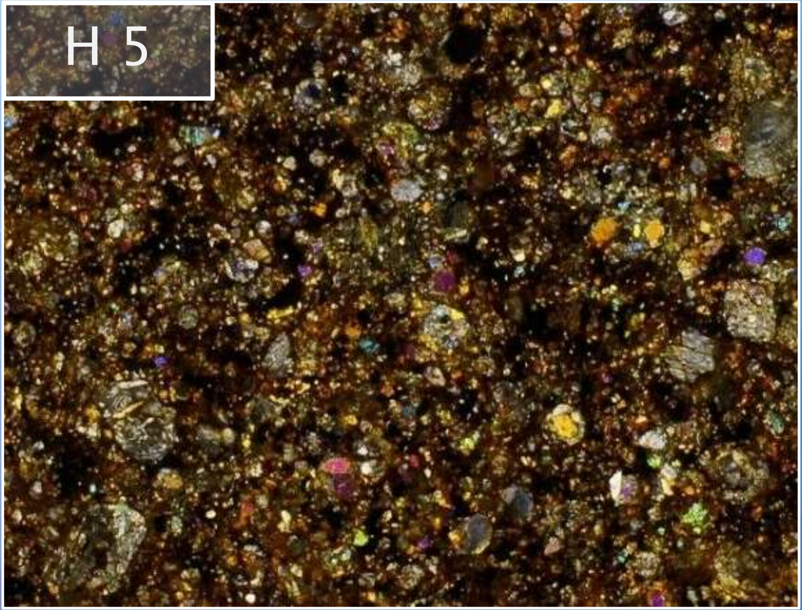
4

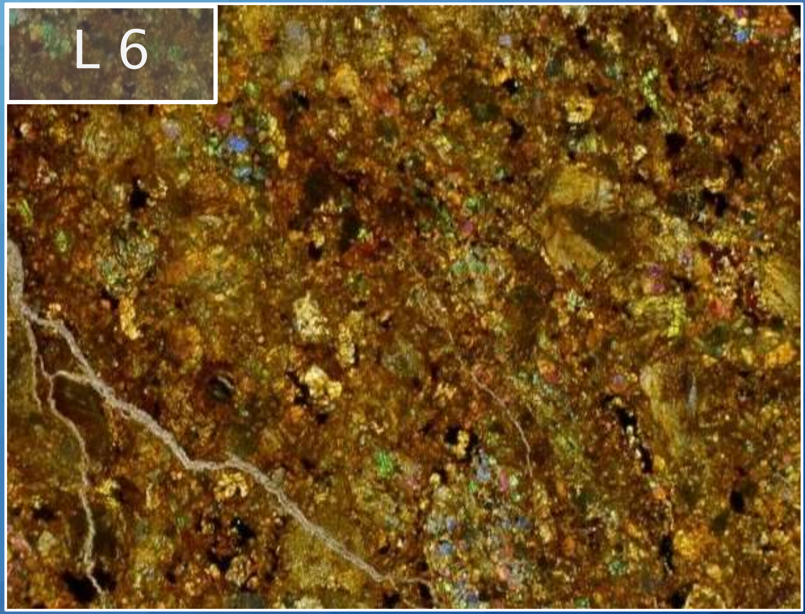
5

6


LL 3.0


LL 4

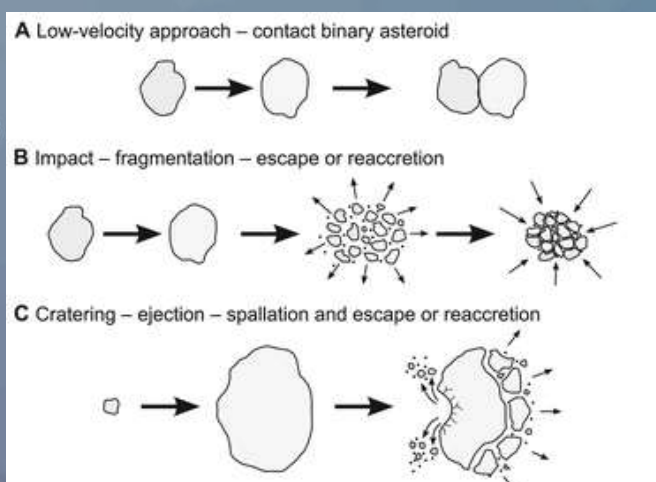

H 5

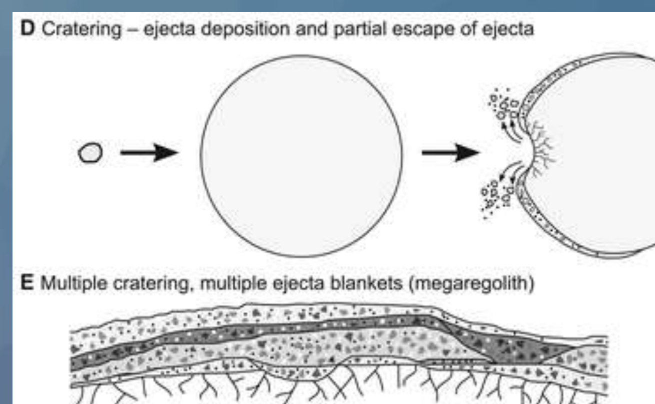

L 6

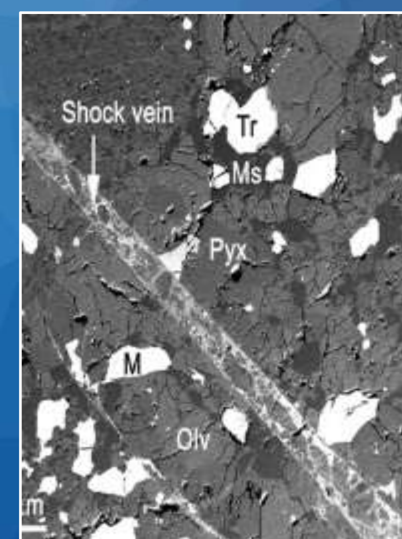
	Tipologia petrològica					
	Alteració aquosa		Inalterat	Alteració tèrmica		
	1	2	3	4	5	6
Homogeneïtat de la composició de l'olivina	-	>5% de desviació mitja		<5%	Homogènia	
Estat estructural del Piroxè baix en Ca	-	monoclínic predominant		>20% monoclínic	<20% monoclínic	Ortoròmbic
Feldespat	-	pocs grans primaris		Grans secundaris menors de 2 micròmetres	Grans secundaris entre 2 y 50 micròmetres	Grans secundaris de més de 50 micròmetres
Cristall a les còndrules	alterat o absent	algun conservat	transparent isotròpic	desvitrificat	absent	
Metall: Ni màxim (%pes)	-	<20 taenita absent o traces	kamacita i taenita amb > 20			
Sulfats: Ni mitjà (%pes)	-	>0,5	<0,5			
Matriu	gra fí i opaca	majoritariament de gra fí i opaca	entre opaca i transparent	transparent, recristalitzada		
Integració Còndrules-Matriu	sense còndrules	còndrules marcades		s'aprecien còndrules però poques amb límits ben marcats	còndrules poc definides	textures primaries destruïdes
Carboni (%pes)	3 a 5	0,8 a 2,6	0,2 a 1	<0,2		
Aigua (%pes)	18 a 22	2 a 16	0,3 a 3	<1,5		

Weisberg et Al.

	pressió Gpa	olivina	piroxè baix en Ca	plagiòclasi	efectes locals
S1	<5	extinció òptica clara, fractures irregulars			cap
S2	5 a 10	extinció ondulant- fractures irregulars, algunes fractures planars			cap
S3	10 a 15	fractures planars	lameles de clinoenstatita		venes de xoc fosques dipòsits de material fos
		extinció ondulant			
			fractures irregulars		
S4	15 a 30	mosaicisme dèbil		extinció ondulant, isotropia parcial	venes de xoc opaques que connecten amb diposits de material fos.
			twinning (100)		
S5	45 a 60	mosaicisme destacat		maskelinita	venes de xoc opaques que connecten amb abundants diposits de material fos.
		deformació planar			
S6	75 a 90	ringwoodita recristalització de l'olivina	majorita	fusió a vidre	venes de xoc opaques que connecten amb abundants diposits de material fos.
Fusió per xoc	>100	tota la roca fosa produïnt de vegades bretxes			



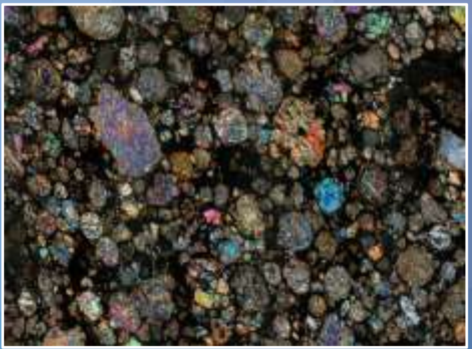




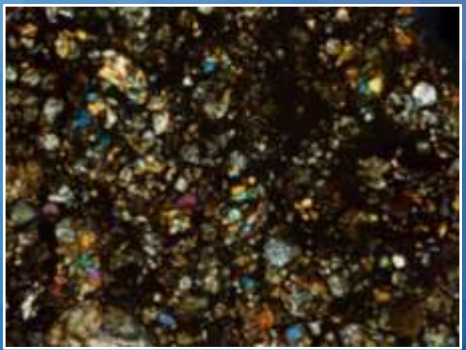
Meteorització	Característiques
W0	Meteorits recuperats en el moment de la seva caiguda
W1	Rastres d'oxidació al voltant del grans de metall
W2	Oxidació moderada del metall
W3	Forta oxidació del metall. El 60-90% d'aquest ha desaparegut
W4	Completa oxidació del metall. Silicats no alterats
W5	Comença l'alteració dels silicats
W6	Silicats substituïts per argiles i òxids.

Les condrites ordinàries

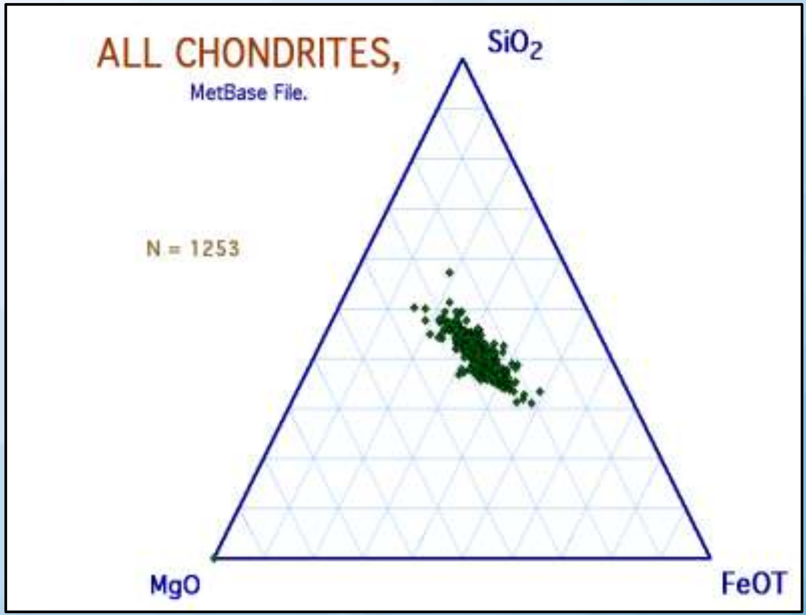
LL

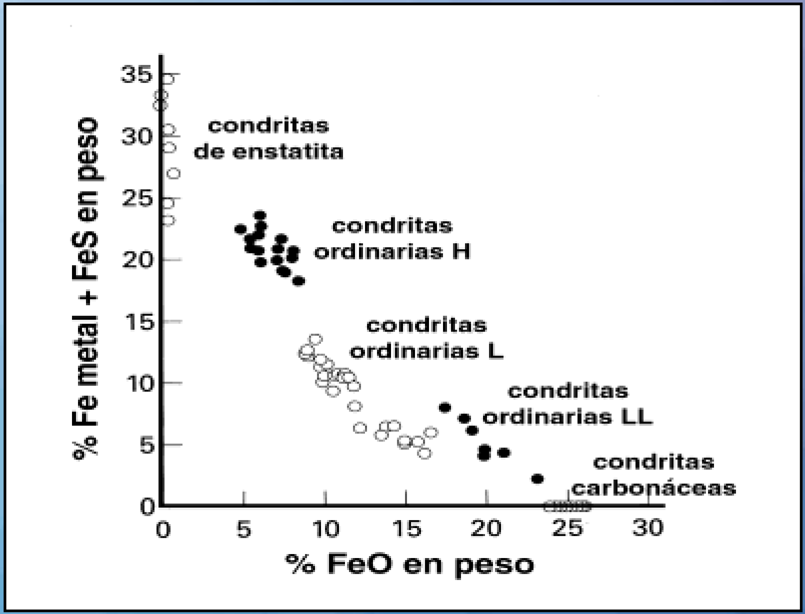


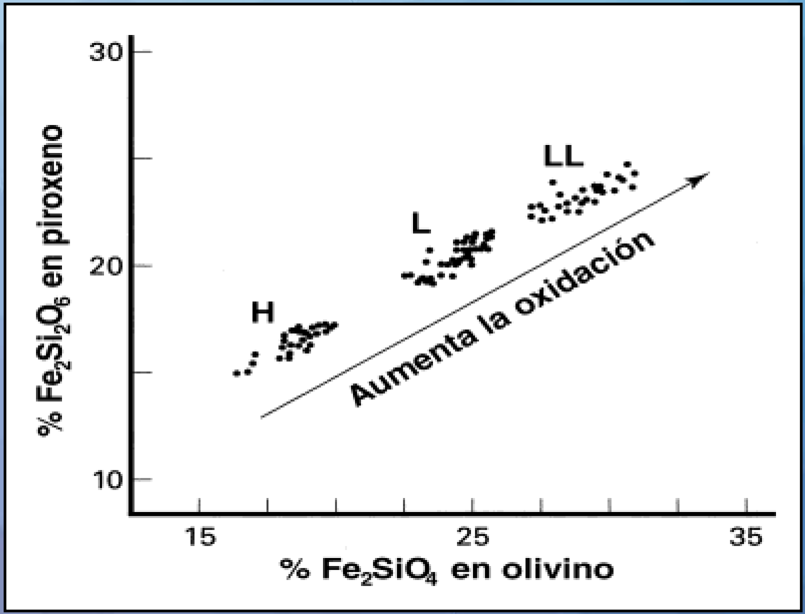
L

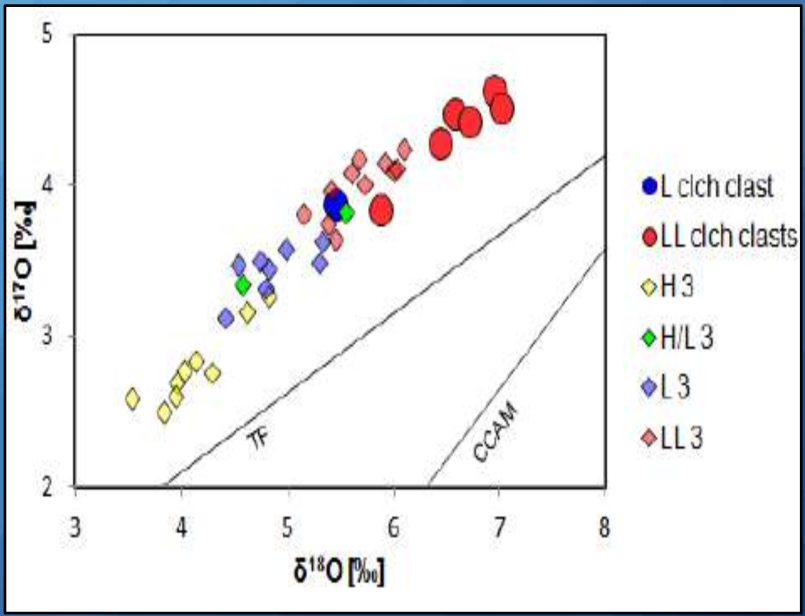


H

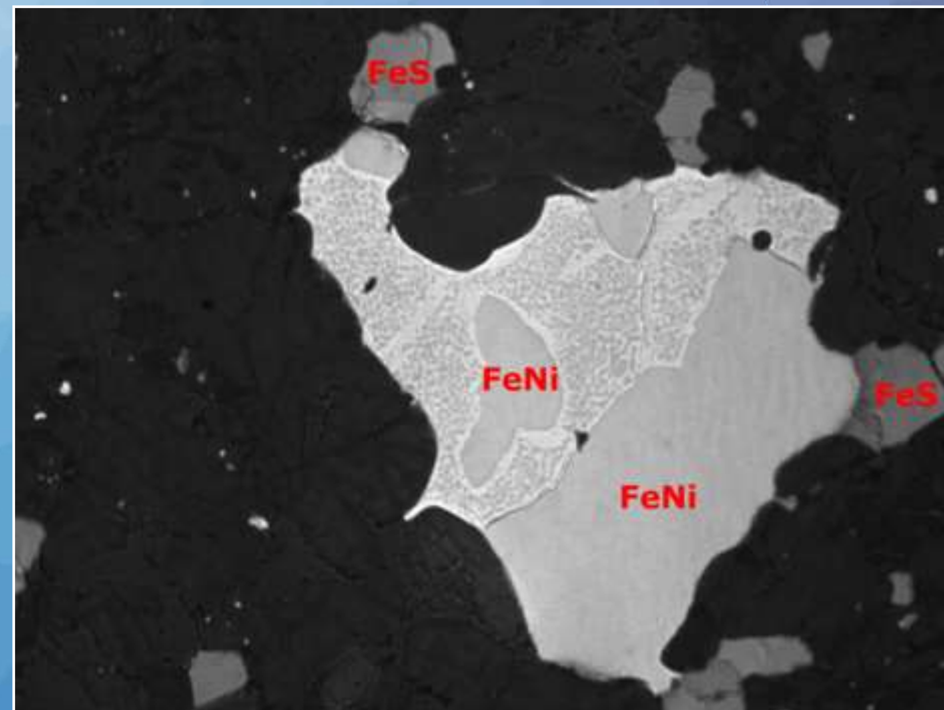

ALL CHONDRITES,
MetBase File.
SiO2
N = 1253
MgO
FeOT


% Fe metal + FeS en peso
condritas de enstatita
condritas ordinarias H
condritas ordinarias L
condritas ordinarias LL
condritas carbonáceas
% FeO en peso


% Fe2Si2O6 en piroxeno
H
L
LL
Aumenta la oxidación
% Fe2SiO4 en olivino


δ17O [‰]
δ18O [‰]
TF
CCAM
L clch clast
LL clch clasts
H 3
H/L 3
L 3
LL 3


VILLALBETO-04


FeS
FeNi
FeNi
FeS

Les condrites d'enstatita

EL

EH

Les condrites carbonàcies

CI

Ivuna

CM

Mighei

CB

Bencubbin

CV

Vigarano

CO

Ornans

CK

Karoonda

CR

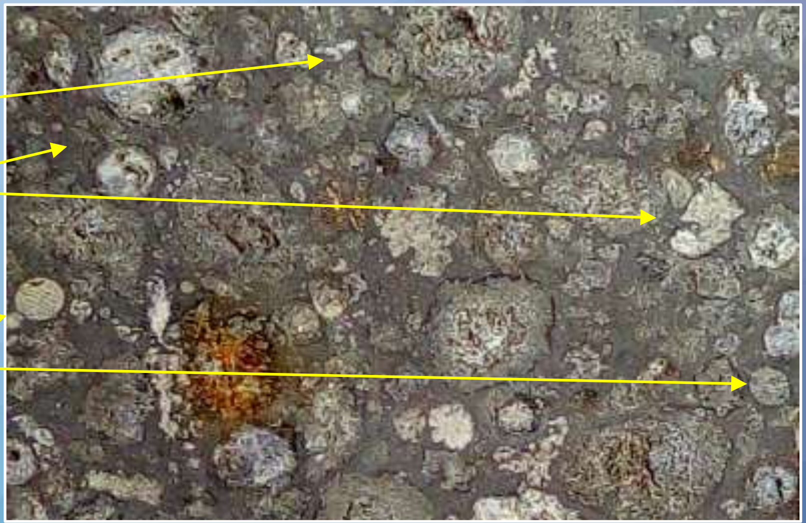
Renazzo

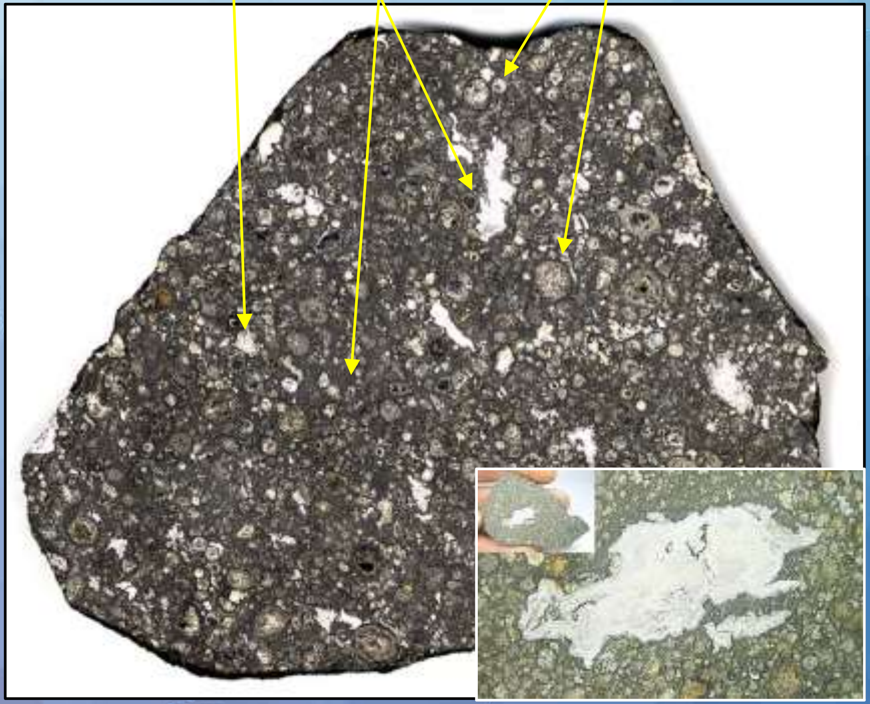
CH

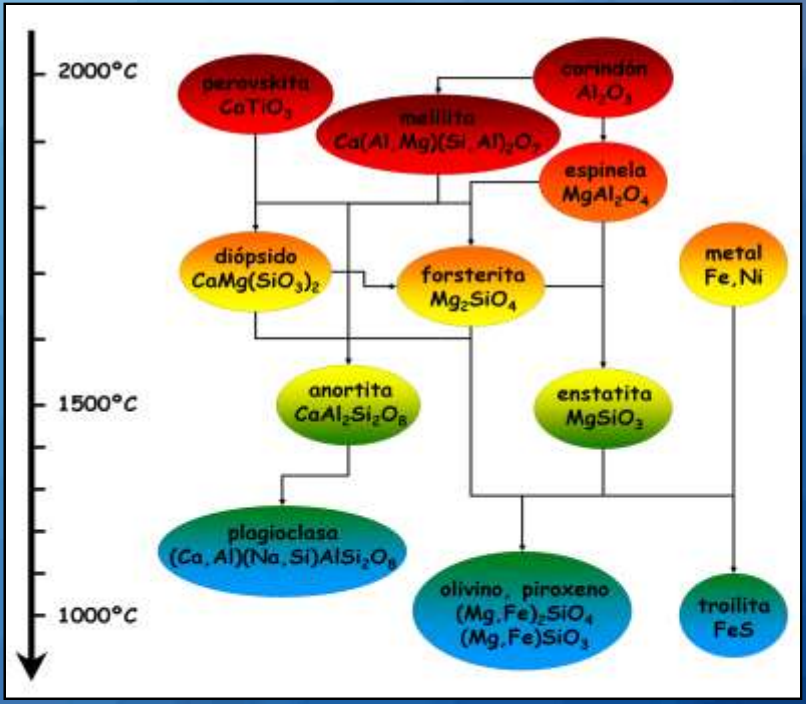
CAI

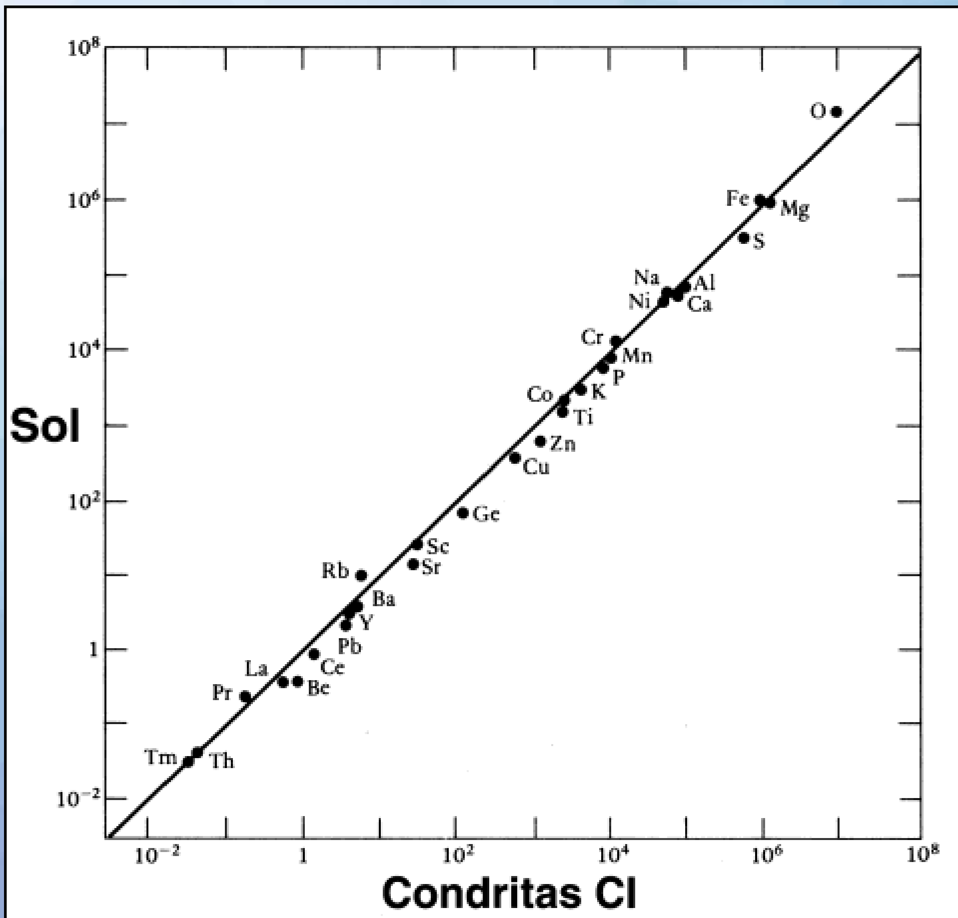
Matriu

Còndrula

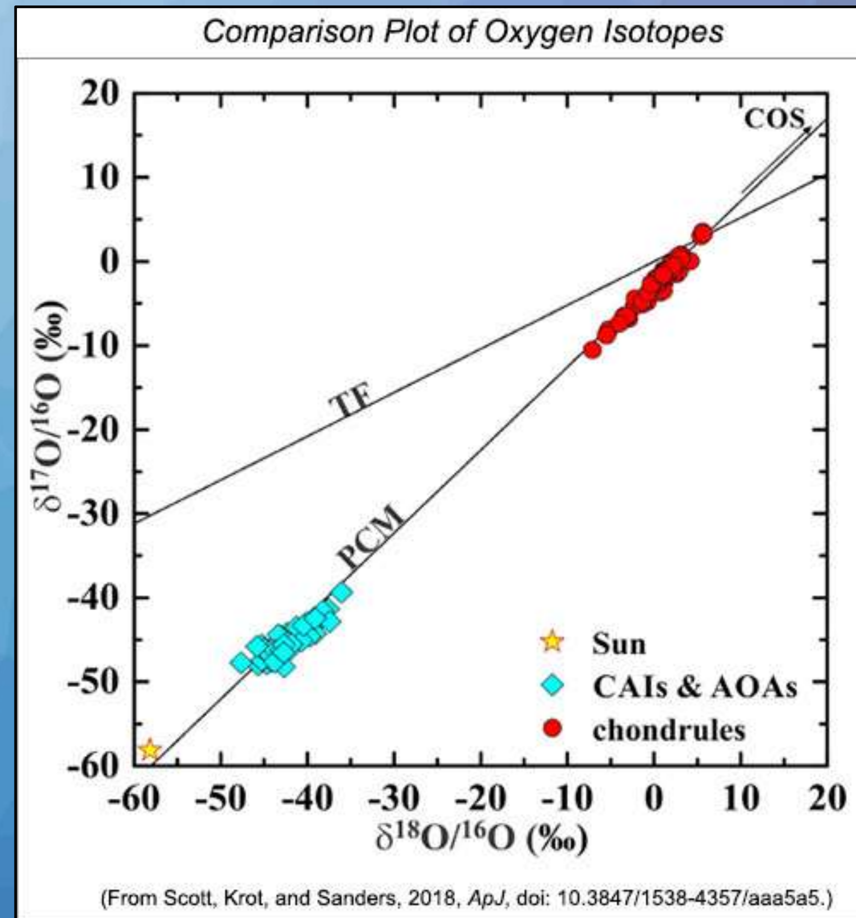








Sol
Condritas CI
O
Fe
Mg
S
Na
Ni
Al
Ca
Cr
Mn
P
K
Co
Ti
Zn
Cu
Ge
Sc
Sr
Rb
Ba
Y
Pb
La
Ce
Be
Pr
Tm
Th

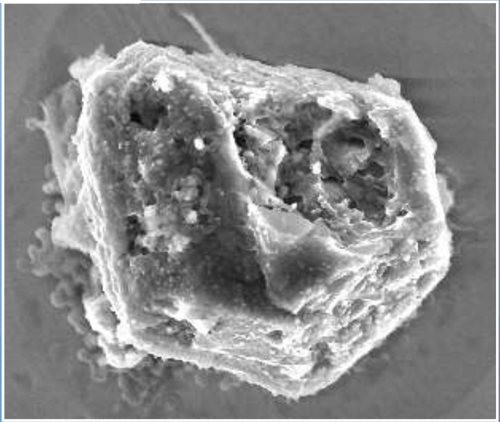


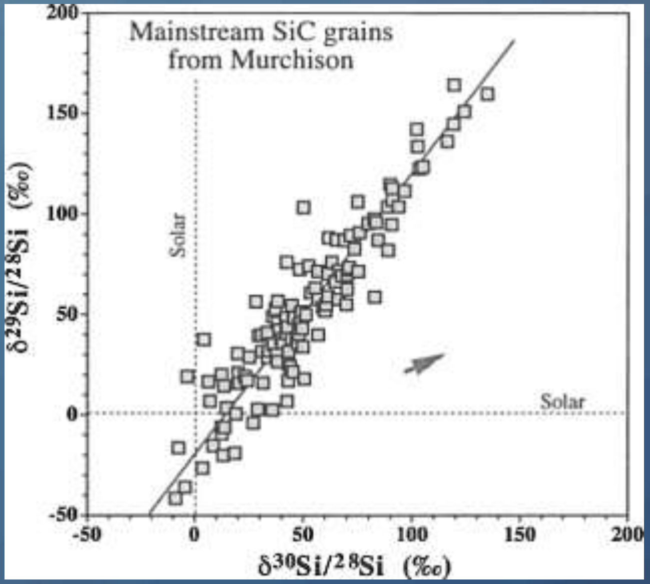
Comparison Plot of Oxygen Isotopes
COS
TF
PCM
Sun
CAIs & AOAs
chondrules
δ17O/16O (‰)
δ18O/16O (‰)
(From Scott, Krot, and Sanders, 2018, ApJ, doi: 10.3847/1538-4357/aaa5a5.)

Grans presolars

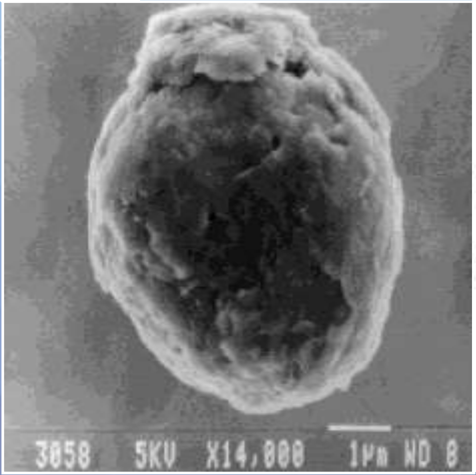
Phase	Abundance (ppm)	Size
Diamond	1400	2 nm
SiC	14	0.1–20 μm
Graphite	10	1–20 μm
TiC, ZrC, MoC, RuC, FeC, Fe-Ni	(sub-grains in graphite)	5–220 nm
Silicon Nitride (Si_3N_4)	>0.002	~1 μm
Spinel ($MgAl_2O_4$)	1	0.1–3 μm
Corundum (Al_2O_3)	<0.1	0.1–3 μm
Hibonite ($CaAl_{12}O_{19}$)	0.002	~2 μm
Silicates	500 (in IDPs)	0.3–1 μm

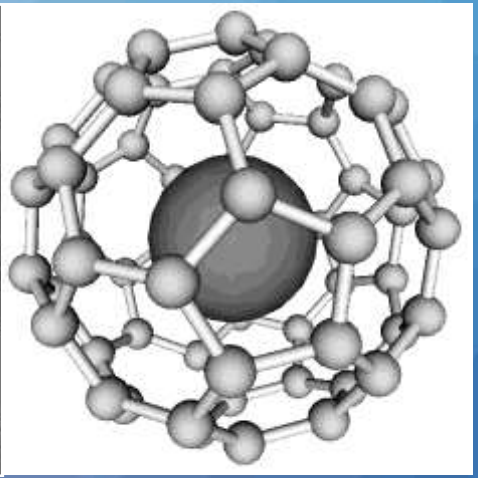
SiC





Grafit





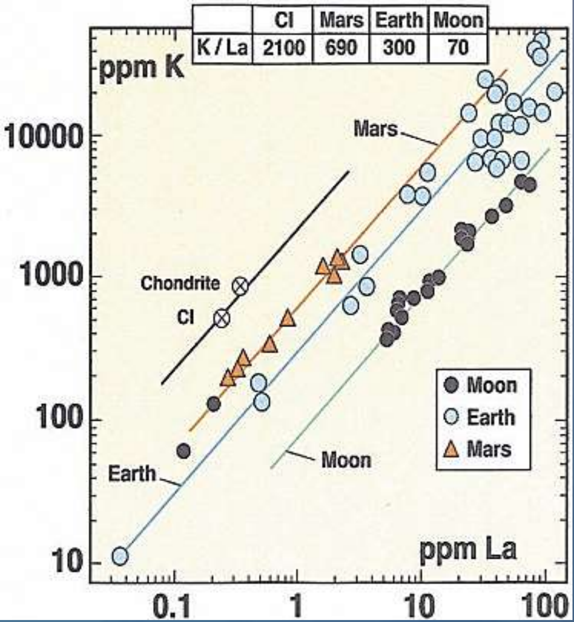
Molècules orgàniques

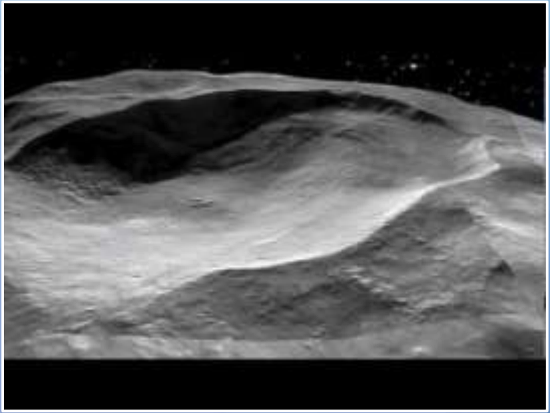
Tipo de compuesto	Concentr. (ppm)	Especies identificadas	Longitud de cadena	Ejemplos
Hidrocarburos alifáticos	35	210	C_1-C_{30}	Propano, isobutano, benceno, ...
Hidrocarburos aromáticos	21	87	C_6-C_{20}	Pireno, fenantreno, acenaftano, ...
Alcoholes	11	8	C_1-C_4	Etanol, metanol, propanol, ...
Aldehídos y cetonas	27	9	C_1-C_5	Dimetilcetona, formaldehído, ...
Ácidos carboxílicos	330	63	C_1-C_{12}	Ácid acético, ácido valérico, ...
Ác. hidroxicarboxílicos	15	101	C_2-C_8	Ácid láctico, ác. α-hidroxiglutárico, ...
Aminas	8	10	C_1-C_4	Metilamina, propilamina, ...
Amidas	62	4	C_1-C_3	Urea, guanilurea, fenilurea, ...
Aminoácidos	60	78	C_2-C_9	Glicina, ácido α-aminoisobutírico, ...
Purinas y pirimidinas	2	5	C_4-C_5	Adenina, xantina, guanina, uracilo, ...
Otros heterociclos	7	38	C_5-C_{10}	Dibenzotiofeno, quinolina, ...
Ác. sulfónicos y fosfónicos	5	12	C_1-C_4	Ác. metilsulfónico, ác. etilfosfónico, ..
Polímeros	>2300	-	$C_{>100}$	$C_{100}H_{48-71}N_{1.8-3}O_{12}S_2$

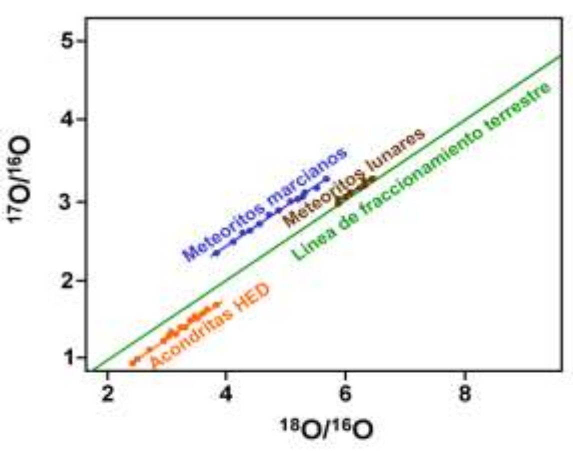
Total	>2800	625

Les acondrites

Les acondrites planetàries







Meteorits lunars

Bretxes

Basalt

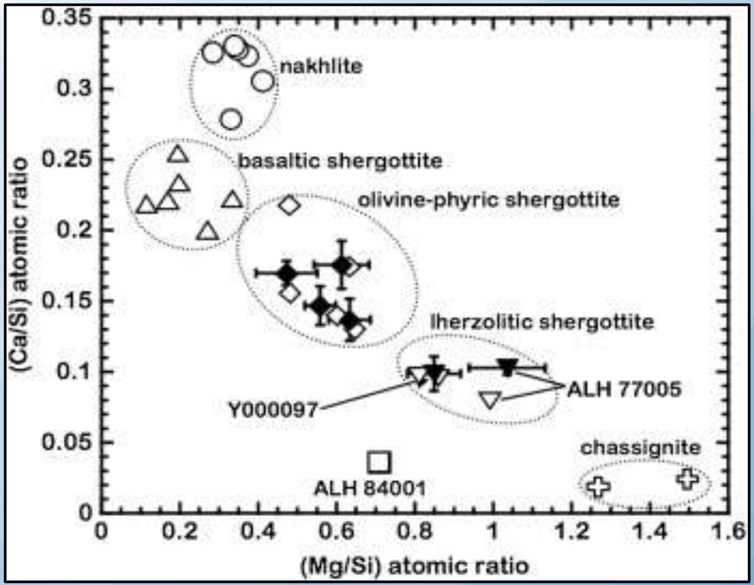
Meteorits marcians

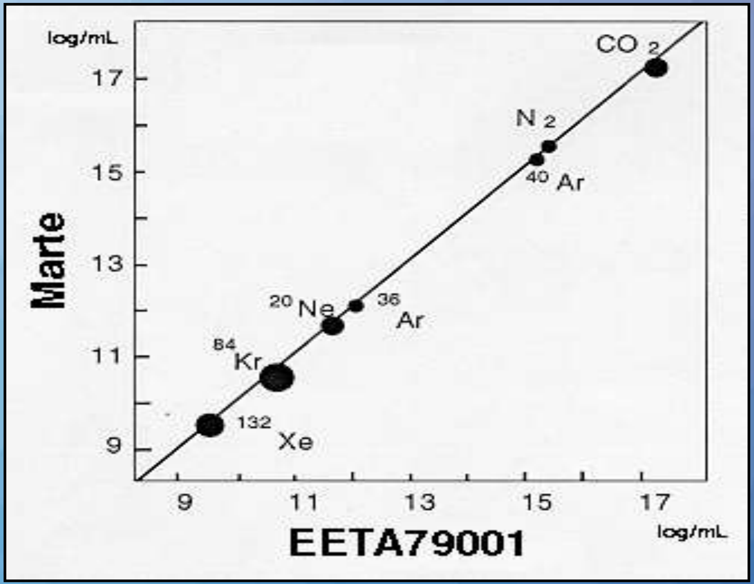
Shergottita

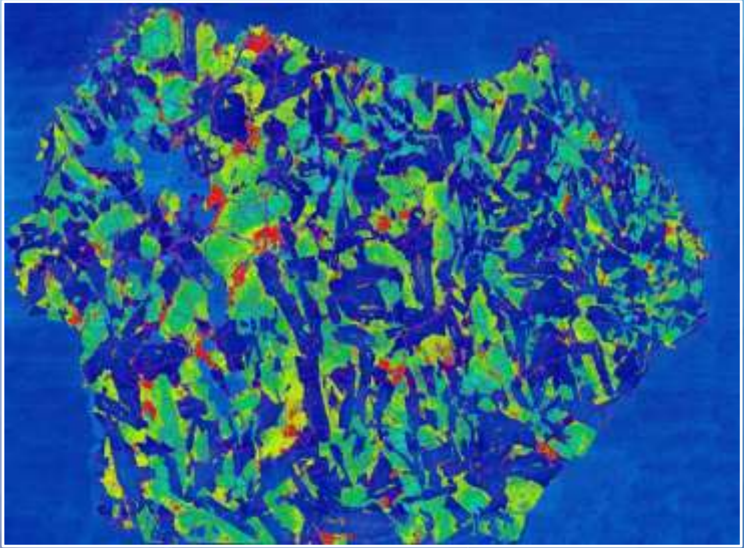
Nakhlita

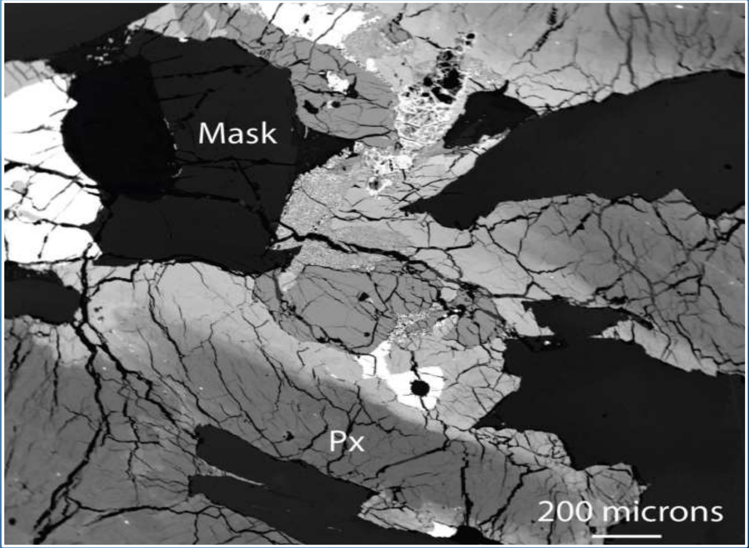
Chassignita

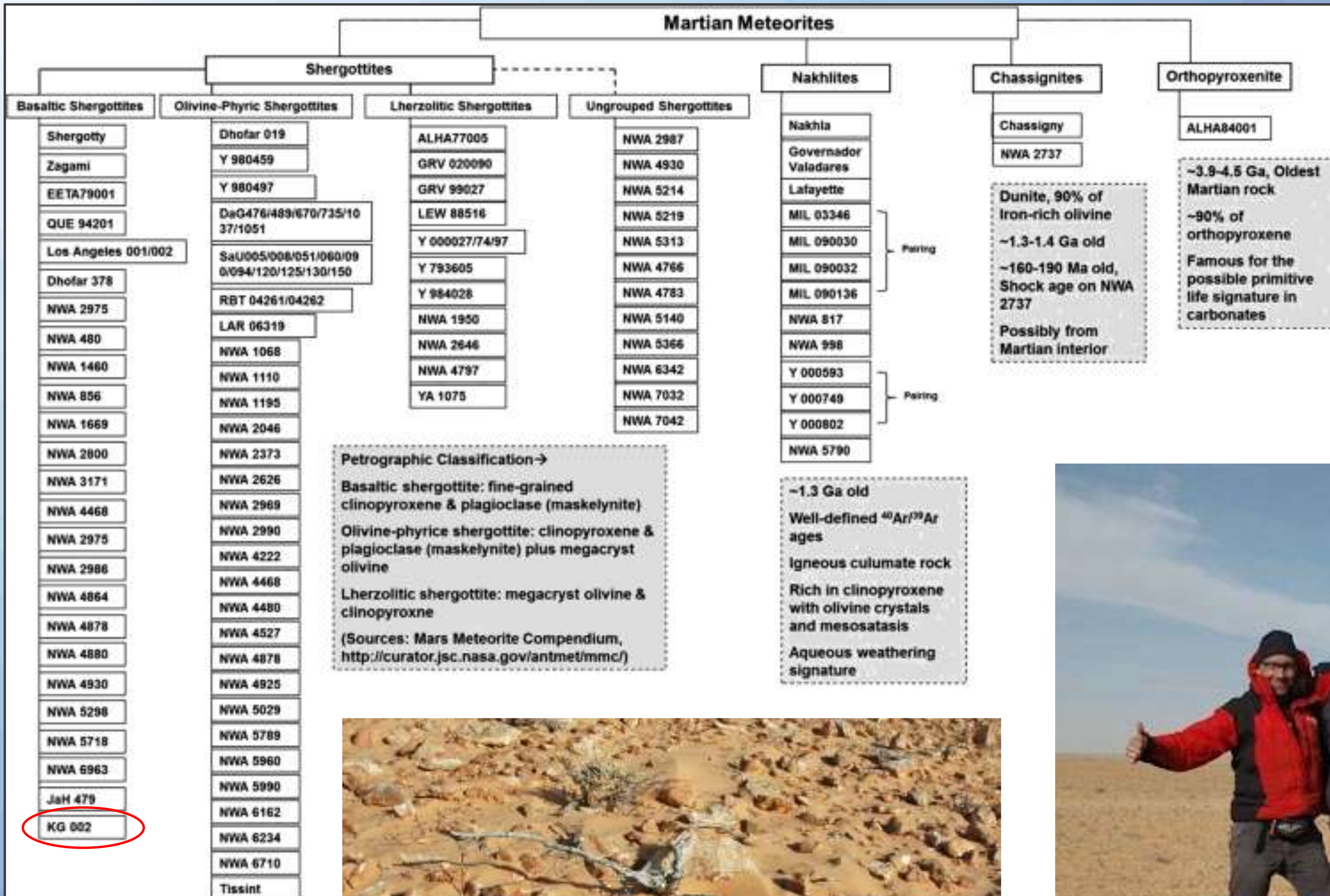
Ortopiroxenita


(Ca/Si) atomic ratio
(Mg/Si) atomic ratio
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
nakhlite
basaltic shergottite
olivine-phyric shergottite
lherzolitic shergottite
Y000097
ALH 77005
chassignite
ALH 84001

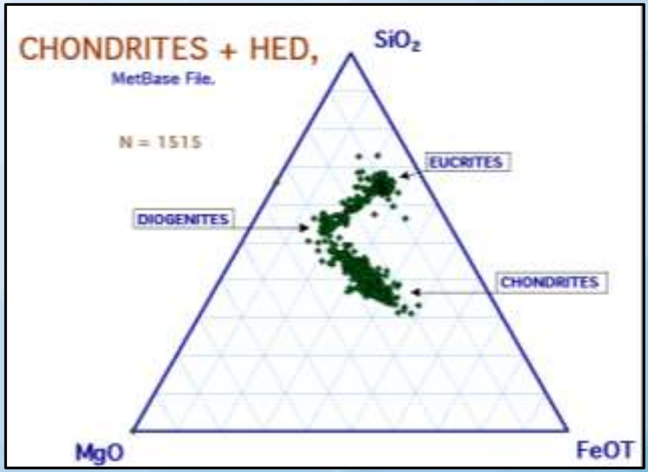

log/mL
Marte
17
15
13
11
9
CO_2
N_2
^{40}Ar
^{20}Ne
^{36}Ar
^{84}Kr
^{132}Xe
9
11
13
15
17
log/mL
EETA79001

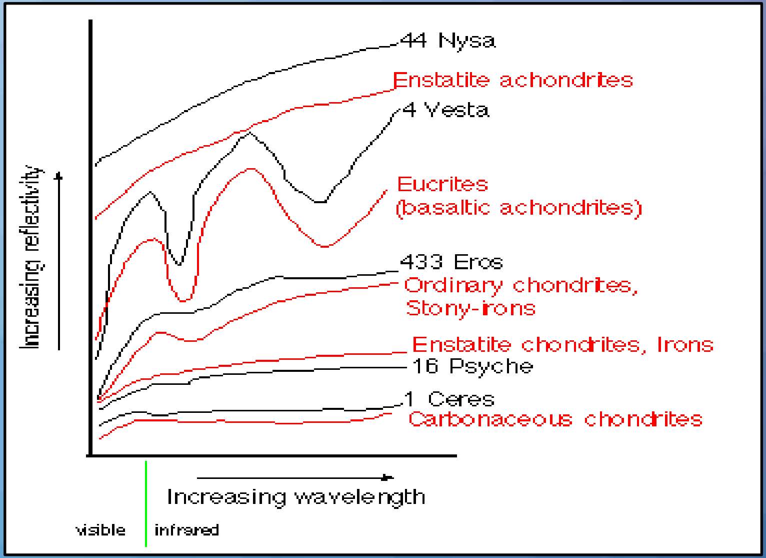


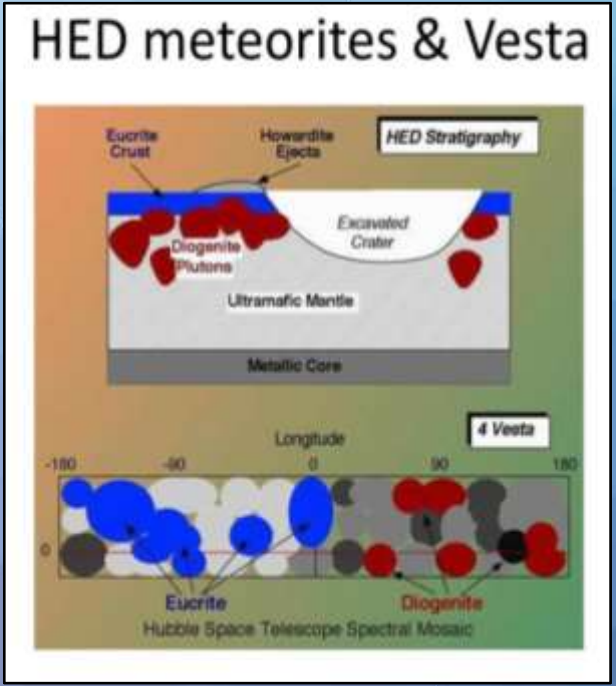

Mask
Px
200 microns

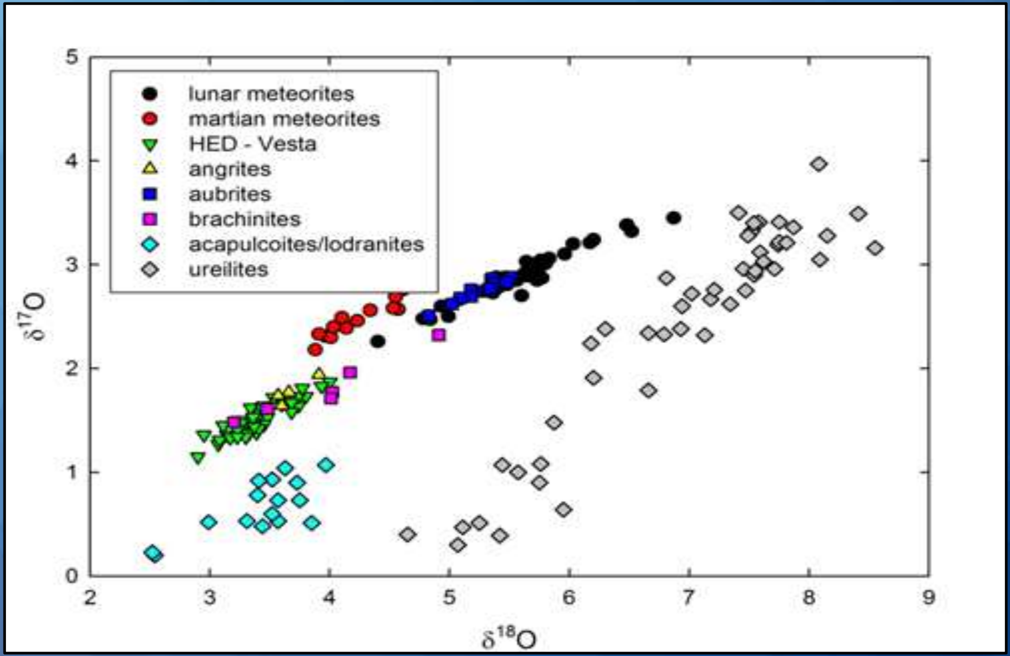

Martian Meteorites
Shergottites
Basaltic Shergottites
Shergotty
Zagami
EETA79001
QUE 94201
Los Angeles 001/002
Dhofar 378
NWA 2975
NWA 480
NWA 1460
NWA 856
NWA 1669
NWA 2800
NWA 3171
NWA 4468
NWA 2975
NWA 2986
NWA 4864
NWA 4878
NWA 4880
NWA 4930
NWA 5298
NWA 5718
NWA 6963
JaH 479
KG 002
Olivine-Phyric Shergottites
Dhofar 019
Y 980459
Y 980497
DaG476/489/670/735/1037/1051
SaU005/008/051/060/090/094/120/125/130/150
RBT 04261/04262
LAR 06319
NWA 1068
NWA 1110
NWA 1195
NWA 2046
NWA 2373
NWA 2626
NWA 2969
NWA 2990
NWA 4222
NWA 4468
NWA 4480
NWA 4527
NWA 4878
NWA 4925
NWA 5029
NWA 5789
NWA 5960
NWA 5990
NWA 6162
NWA 6234
NWA 6710
Tissint
Lherzolitic Shergottites
ALHA77005
GRV 020090
GRV 99027
LEW 88516
Y 000027/74/97
Y 793605
Y 984028
NWA 1950
NWA 2646
NWA 4797
YA 1075
Ungrouped Shergottites
NWA 2987
NWA 4930
NWA 5214
NWA 5219
NWA 5313
NWA 4766
NWA 4783
NWA 5140
NWA 5366
NWA 6342
NWA 7032
NWA 7042
Nakhlites
Nakhla
Governador Valadares
Lafayette
MIL 03346
MIL 090030
MIL 090032
MIL 090136
Pairing
NWA 817
NWA 998
Y 000593
Y 000749
Y 000802
Pairing
NWA 5790
Chassignites
Chassigny
NWA 2737
Orthopyroxenite
ALHA84001
Petrographic Classification→
Basaltic shergottite: fine-grained clinopyroxene & plagioclase (maskelynite)
Olivine-phyrice shergottite: clinopyroxene & plagioclase (maskelynite) plus megacryst olivine
Lherzolitic shergottite: megacryst olivine & clinopyroxne
(Sources: Mars Meteorite Compendium, http://curator.jsc.nasa.gov/antmet/mmc/)
~1.3 Ga old
Well-defined 40Ar/39Ar ages
Igneous culumate rock
Rich in clinopyroxene with olivine crystals and mesosatasis
Aqueous weathering signature
Dunite, 90% of Iron-rich olivine
~1.3-1.4 Ga old
~160-190 Ma old, Shock age on NWA 2737
Possibly from Martian interior
~3.9-4.5 Ga, Oldest Martian rock
~90% of orthopyroxene
Famous for the possible primitive life signature in carbonates

Meteorits asteroidals



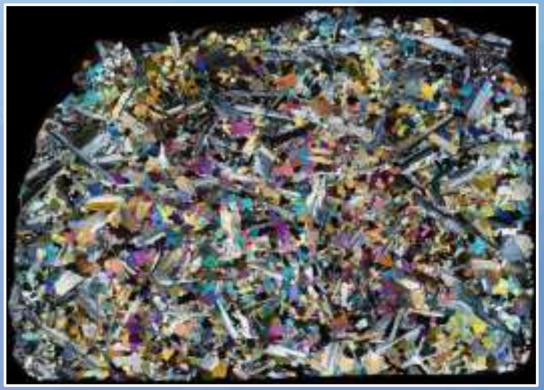




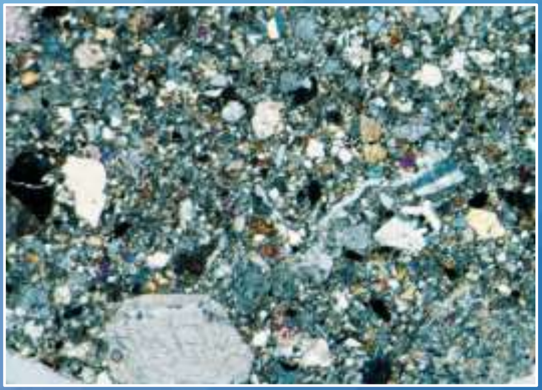


El grup HED

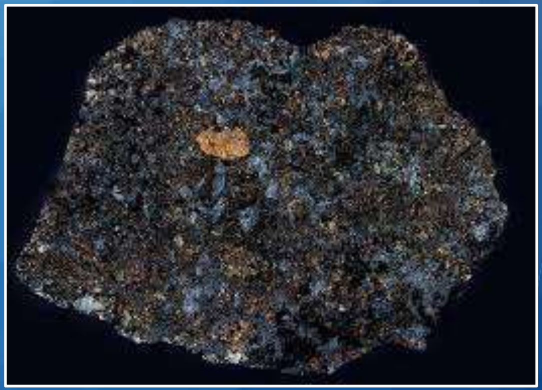
Eucrita



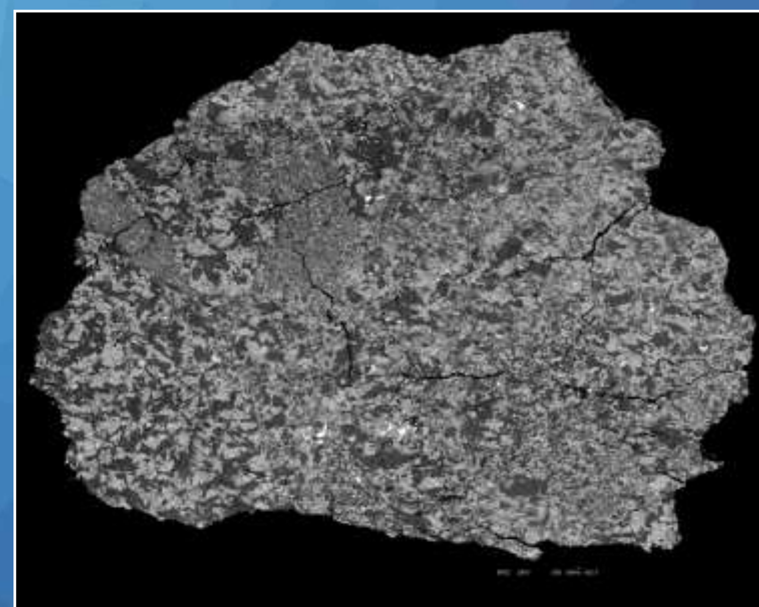
Howardita



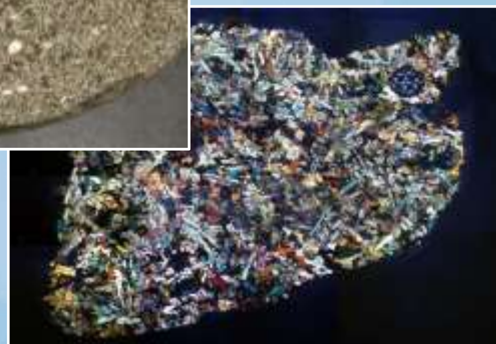
Diogenita



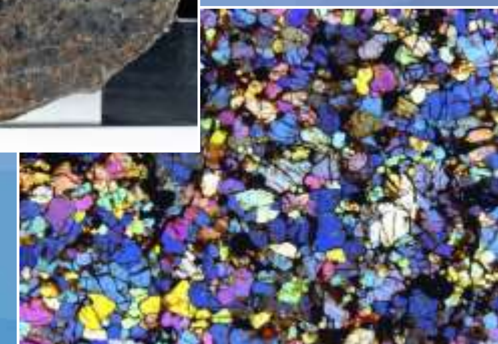


Angrites

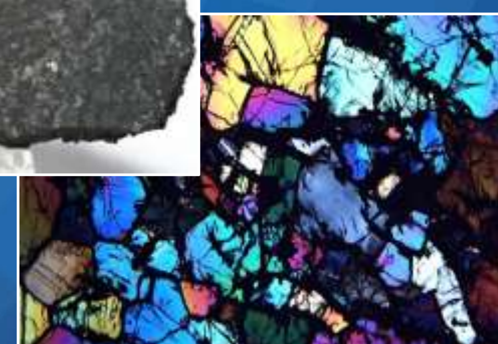


Brachinites



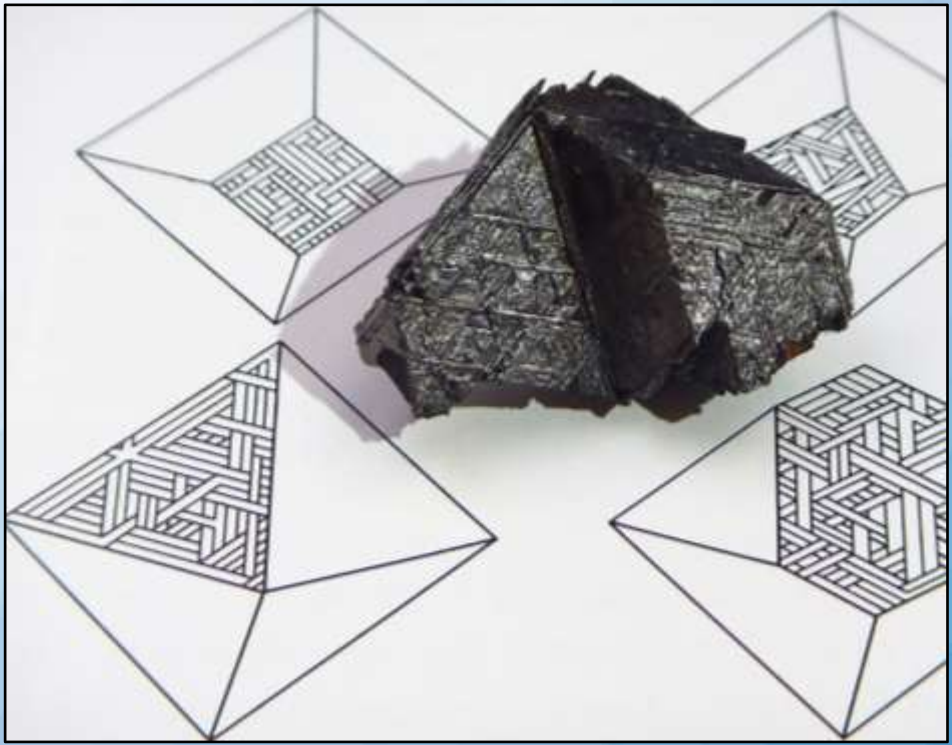
Aubrites

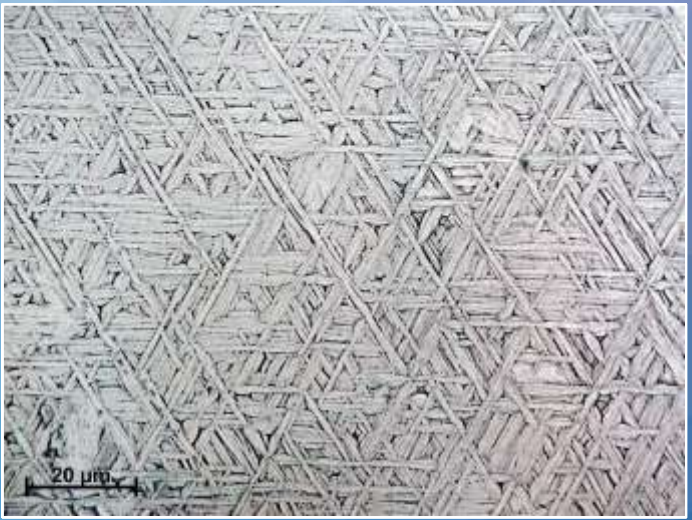
Ureilites

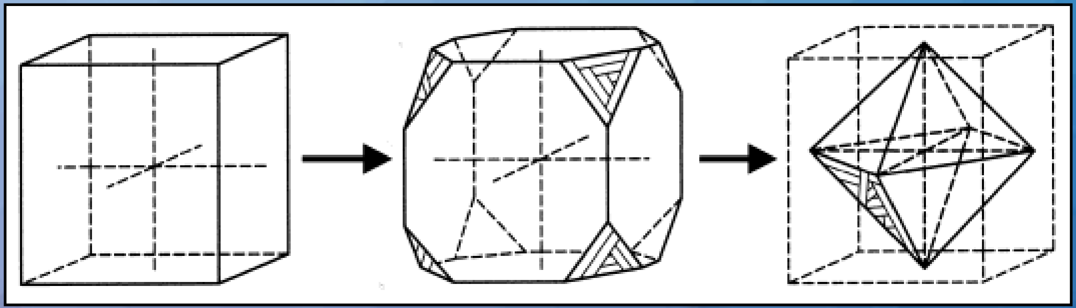


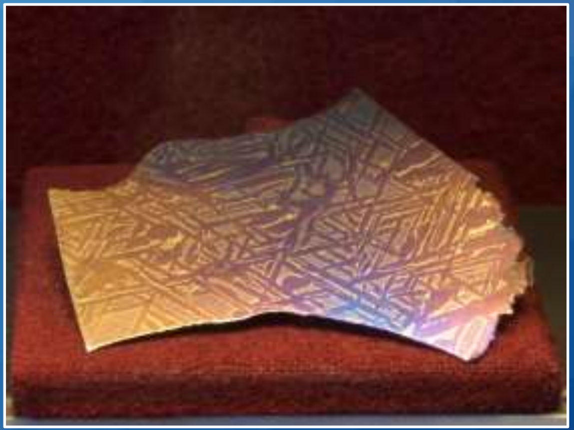
Els metàl·lics

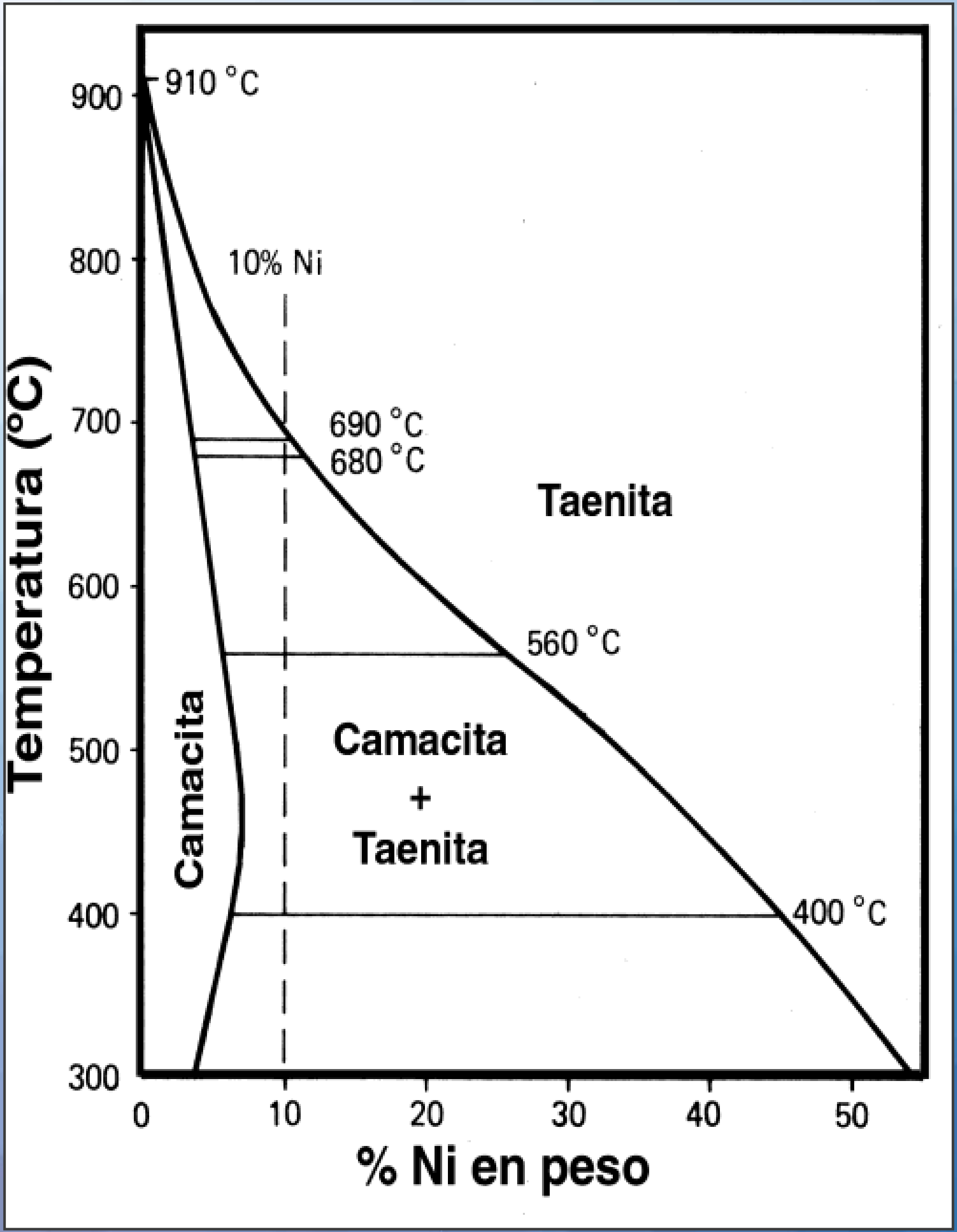
Widmanstätten

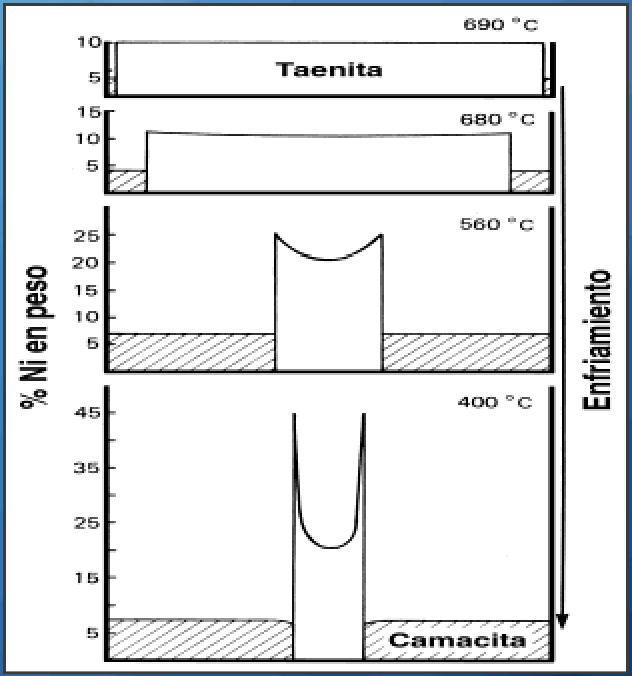


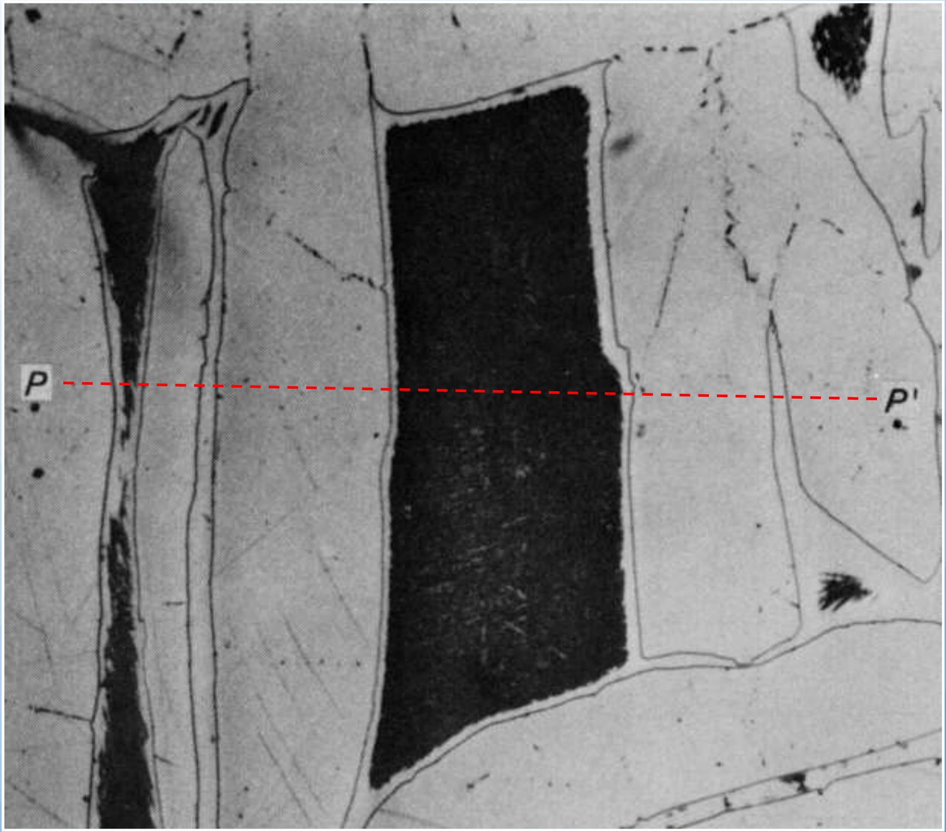


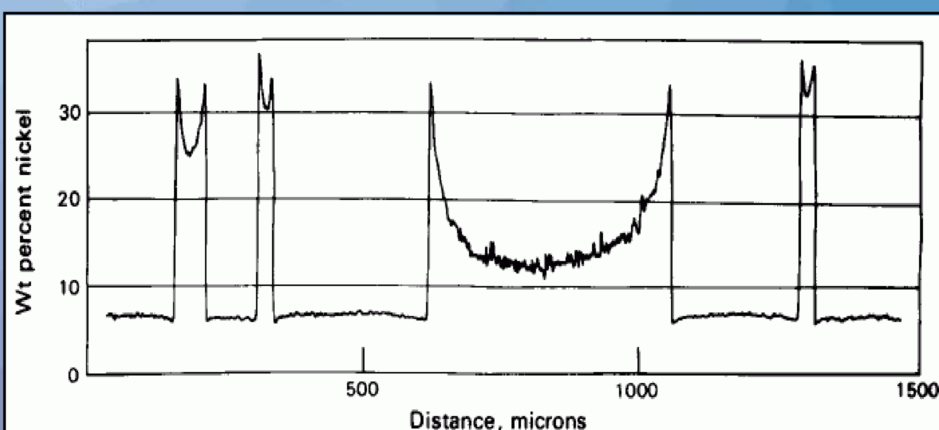





910 °C
900
800
700
600
500
400
300
10% Ni
690 °C
680 °C
560 °C
400 °C
Taenita
Camacita
+
Taenita
Camacita
Temperatura (°C)
0
10
20
30
40
50
% Ni en peso


690 °C
Taenita
680 °C
560 °C
400 °C
% Ni en peso
Camacita
Enfriamiento


P
P'

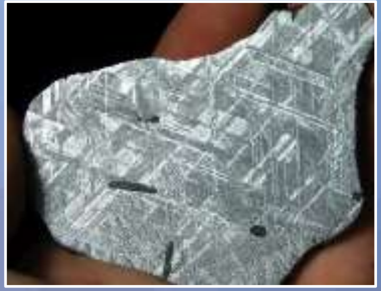

Wt percent nickel
0
10
20
30
500
1000
1500
Distance, microns

Classificació morfològica

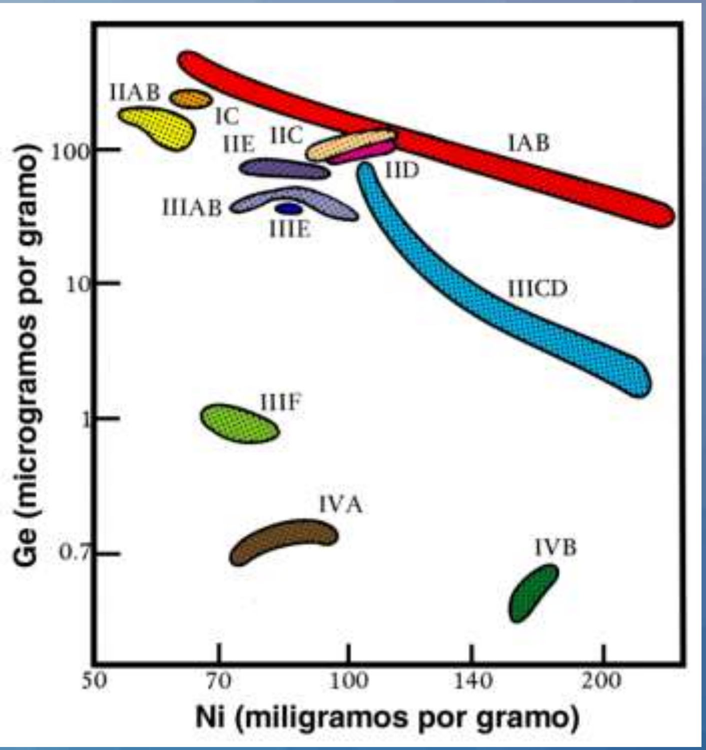
Octaedrita gruixuda


Octaedrita mitjana


Octaedrita fina




Classificació química



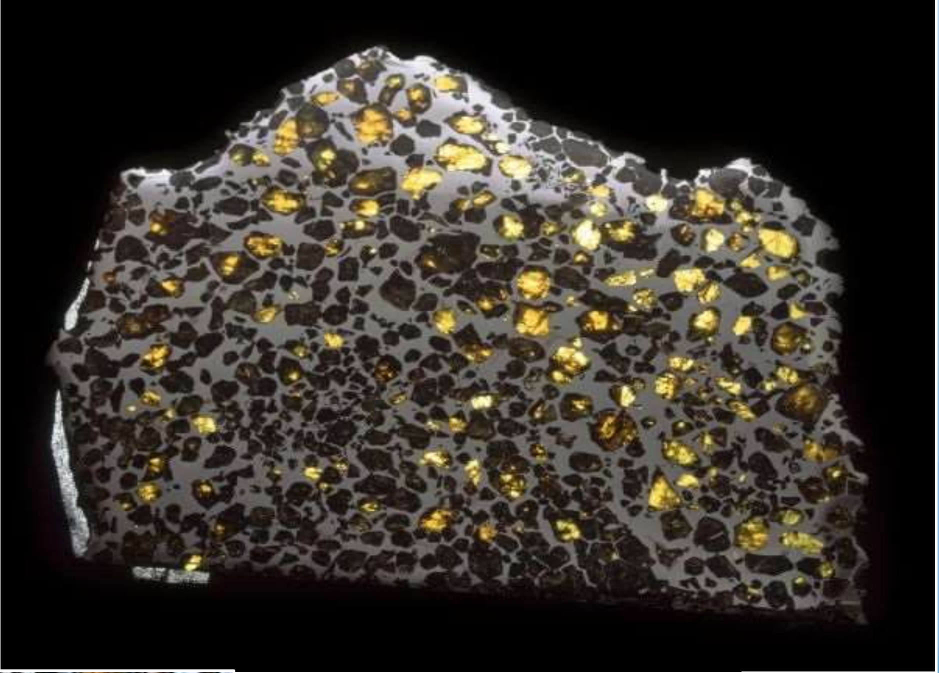
Ataxita



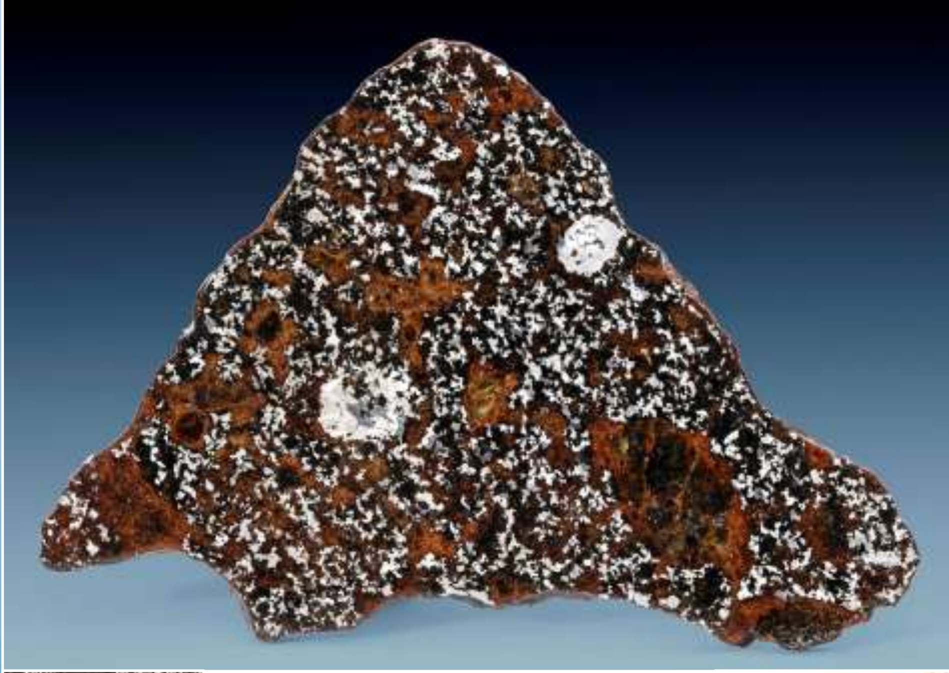

Els metal·lorocosos



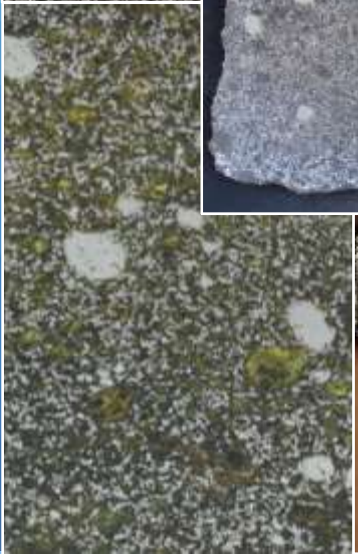




Pallasites

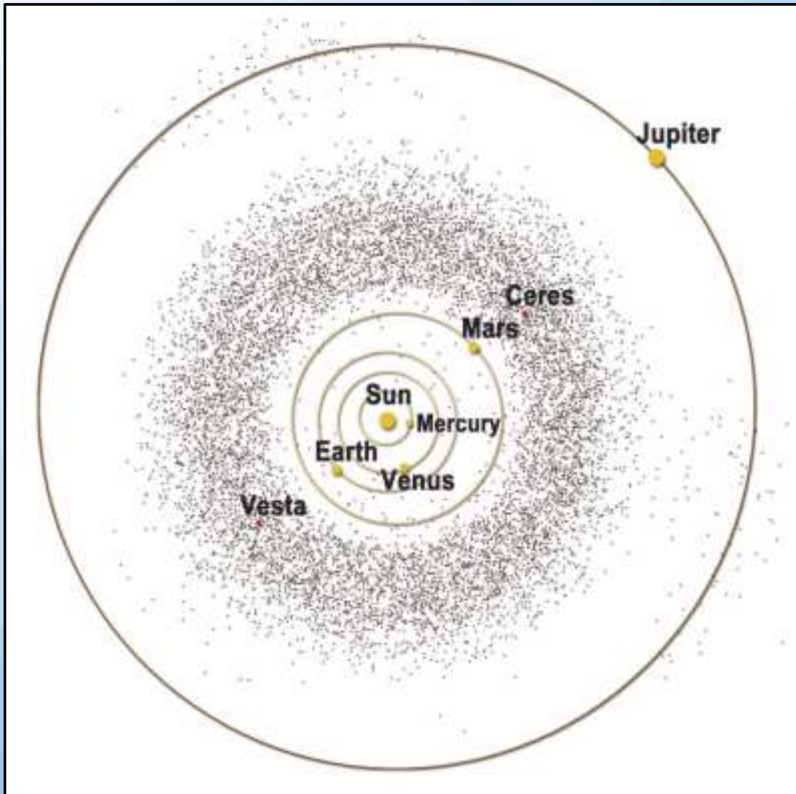


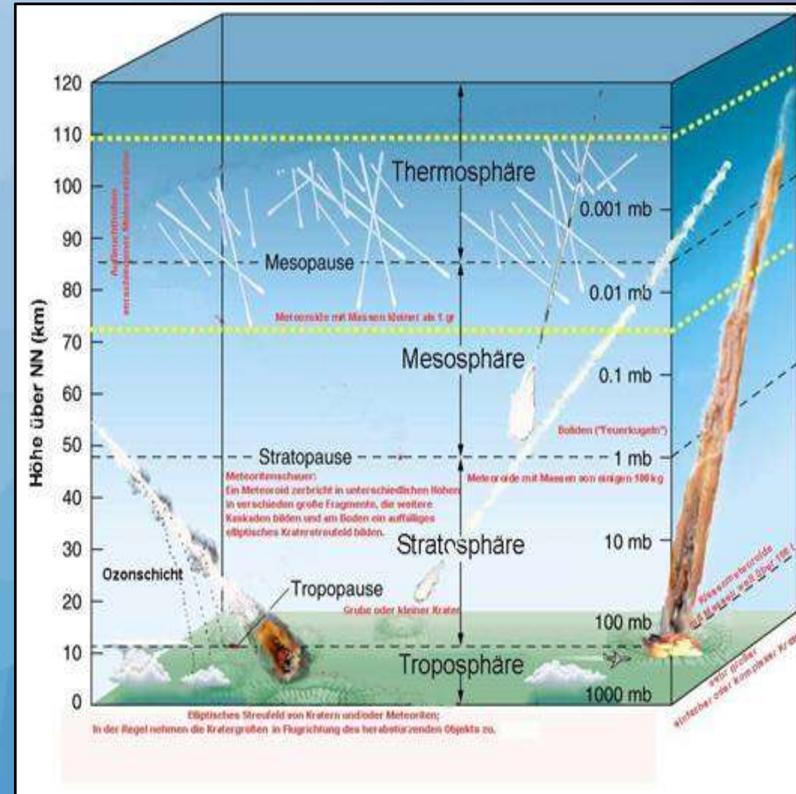
Mesosiderites

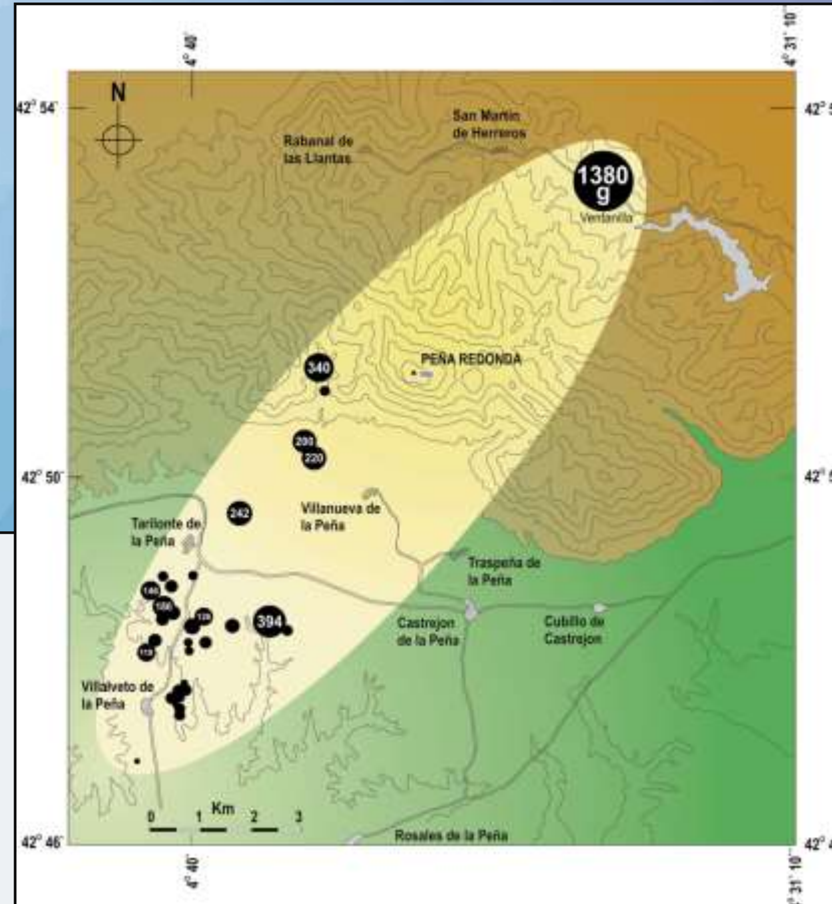


La caiguda a la Terra

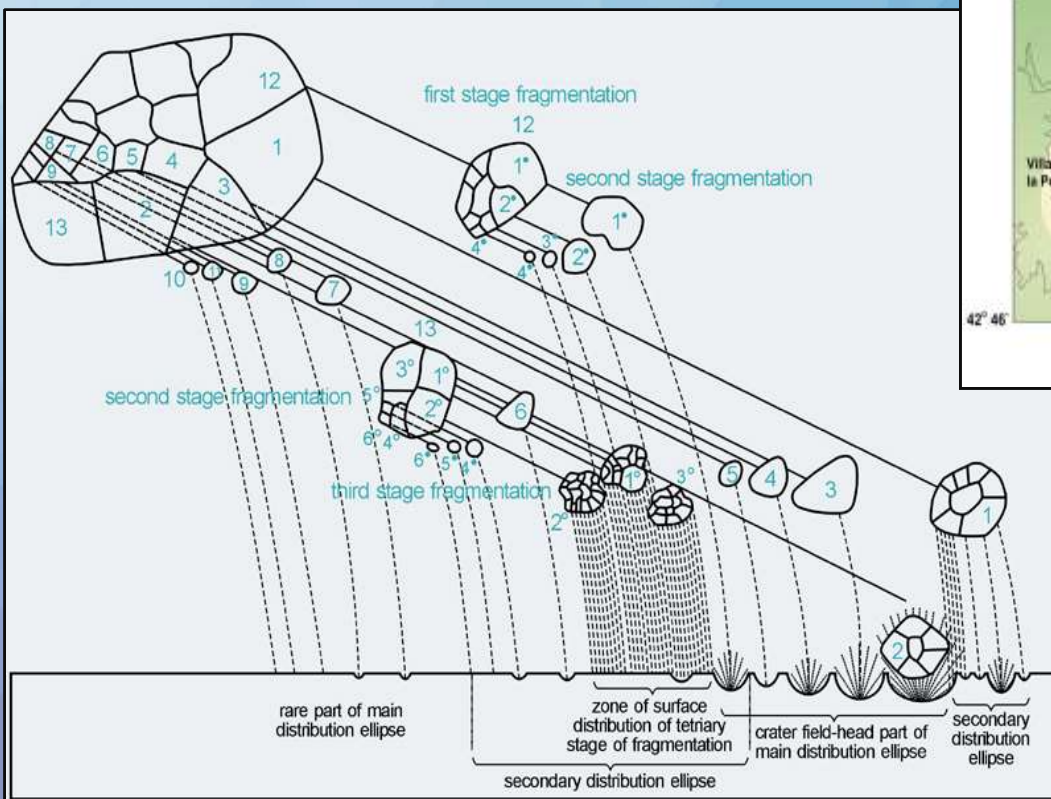
Uns pocs segons de ‘terror’


Jupiter
Ceres
Mars
Sun
Mercury
Earth
Venus
Vesta


Höhe über NN (km)
120
110
100
90
80
70
60
50
40
30
20
10
0
Thermosphäre
0.001 mb
Mesopause
0.01 mb
Meteoroide mit Massen kleiner als 1 gr
Mesosphäre
0.1 mb
Boliden ("Feuerkugeln")
Stratopause
1 mb
Meteoritenschauer: Ein Meteoroid zerbricht in unterschiedlichen Höhen in verschieden große Fragmente, die weitere Kaskaden bilden und am Boden ein auffälliges elliptisches Kraterstreufeld bilden.
Meteoroide mit Massen von einigen 100 kg
Stratosphäre
10 mb
Ozonschicht
Tropopause
Grube oder kleiner Krater
100 mb
Troposphäre
1000 mb
Elliptisches Streufeld von Kratern und/oder Meteoriten;
In der Regel nehmen die Kratergrößen in Flugrichtung des herabstürzenden Objekts zu.



N
4° 40'
4° 31' 10"
42° 54'
42° 50'
42° 46'
Rabanal de las Llantas
San Martin de Herreros
1380 g
Ventanilla
PEÑA REDONDA
340
200
220
242
Villanueva de la Peña
Tarilonte de la Peña
Traspeña de la Peña
394
Castrejon de la Peña
Cubillo de Castrejon
Villalveto de la Peña
0 1 2 3 Km
Rosales de la Peña

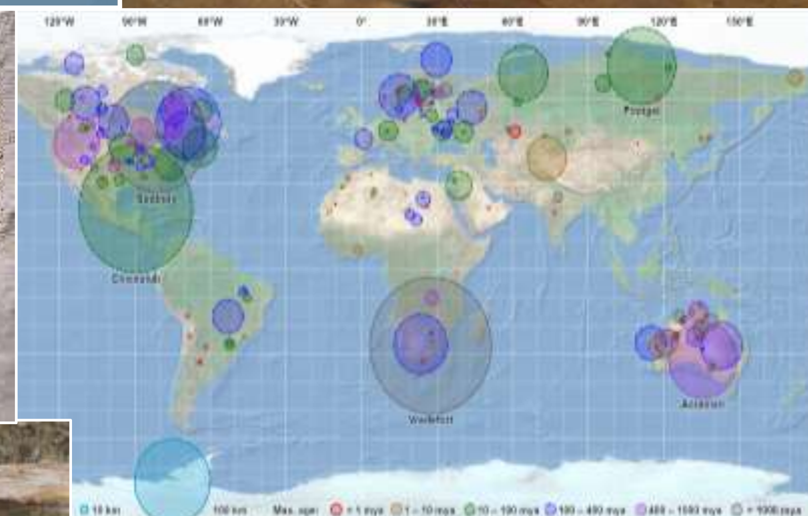


first stage fragmentation
second stage fragmentation
second stage fragmentation
third stage fragmentation
rare part of main distribution ellipse
zone of surface distribution of tetriary stage of fragmentation
crater field-head part of main distribution ellipse
secondary distribution ellipse
secondary distribution ellipse



Cràters d’impacte






Com es reconeixen?

No lliguen amb la geologia de l’entorn





Crosta de fusió i interior de diferent color.

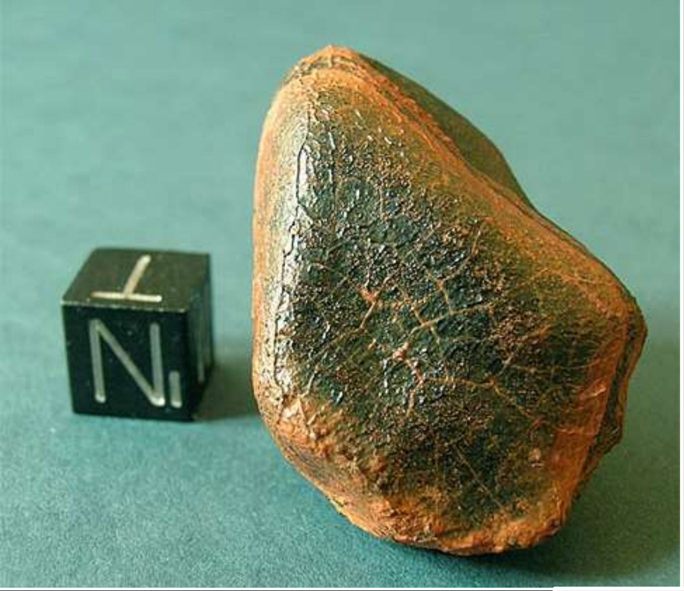
Crosta de fusió trencada per contracció.

Regmalits.



Línies de vol.





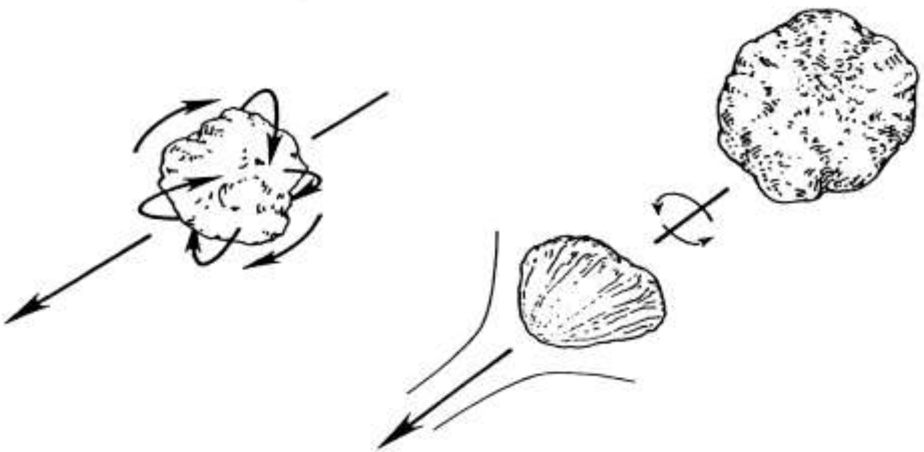

Llavis



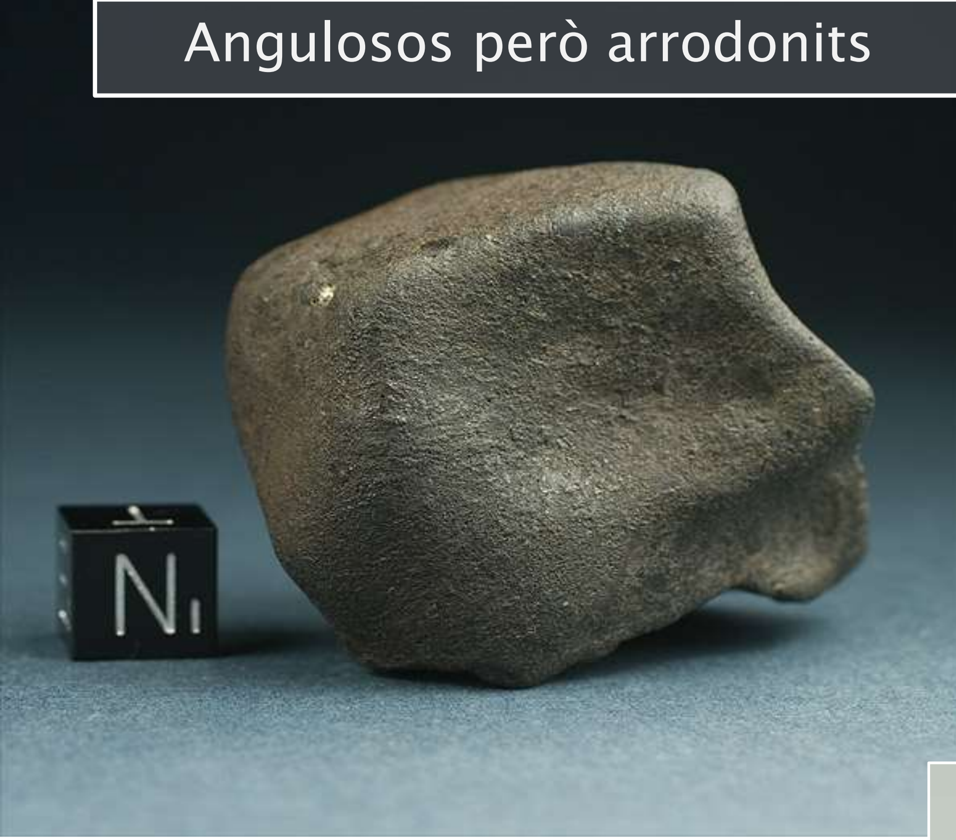


Escuma

Orientació



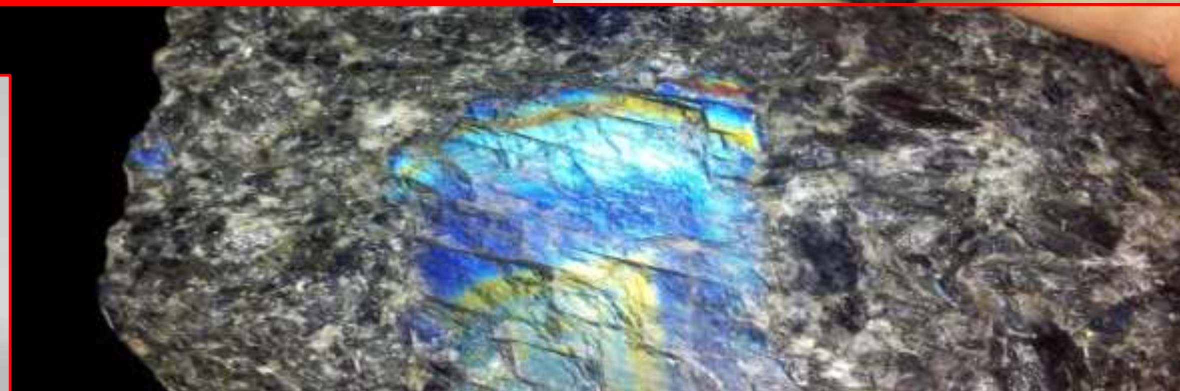
Angulosos però arrodonits



Còndruls visibles

Atrauen un imant

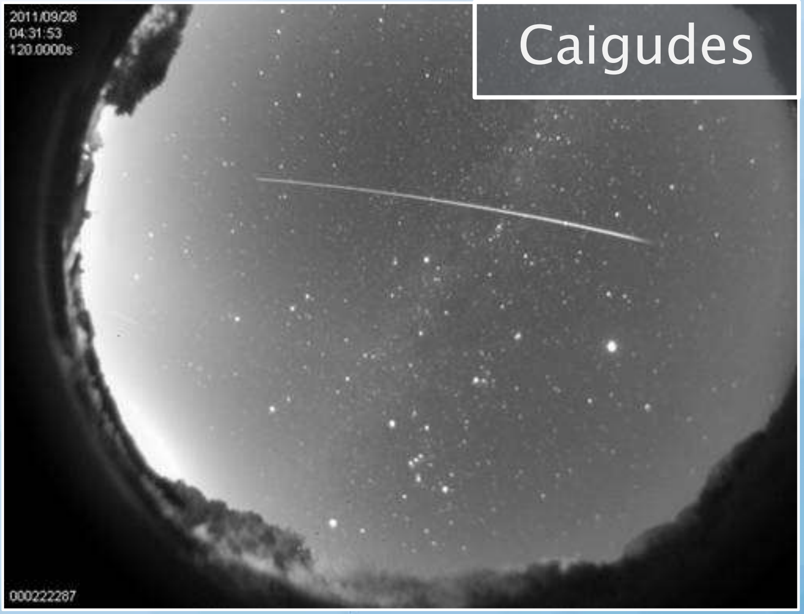
No són meteorits

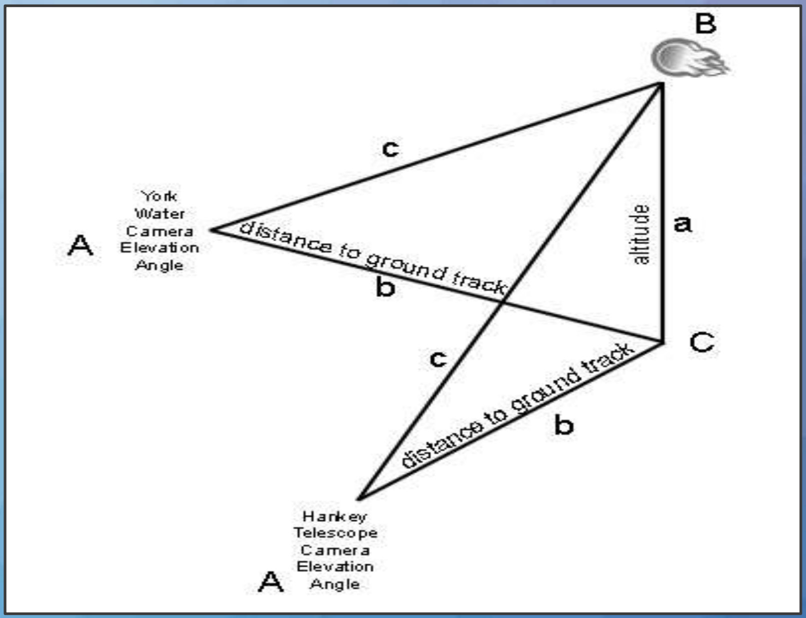


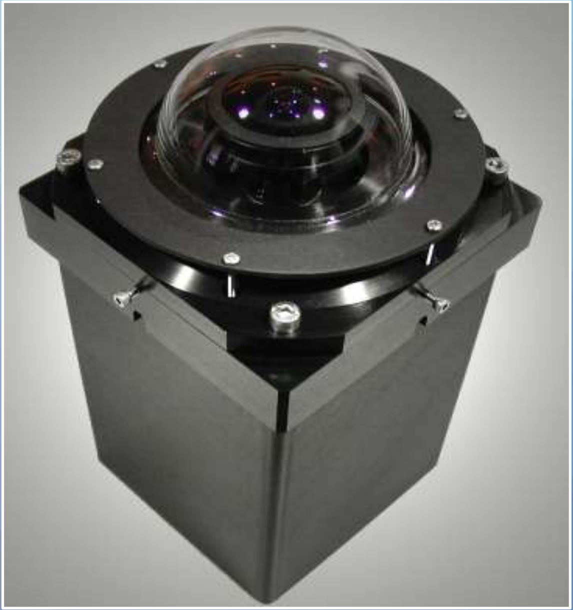
Recuperació de meteorits

Caigudes

Troballes

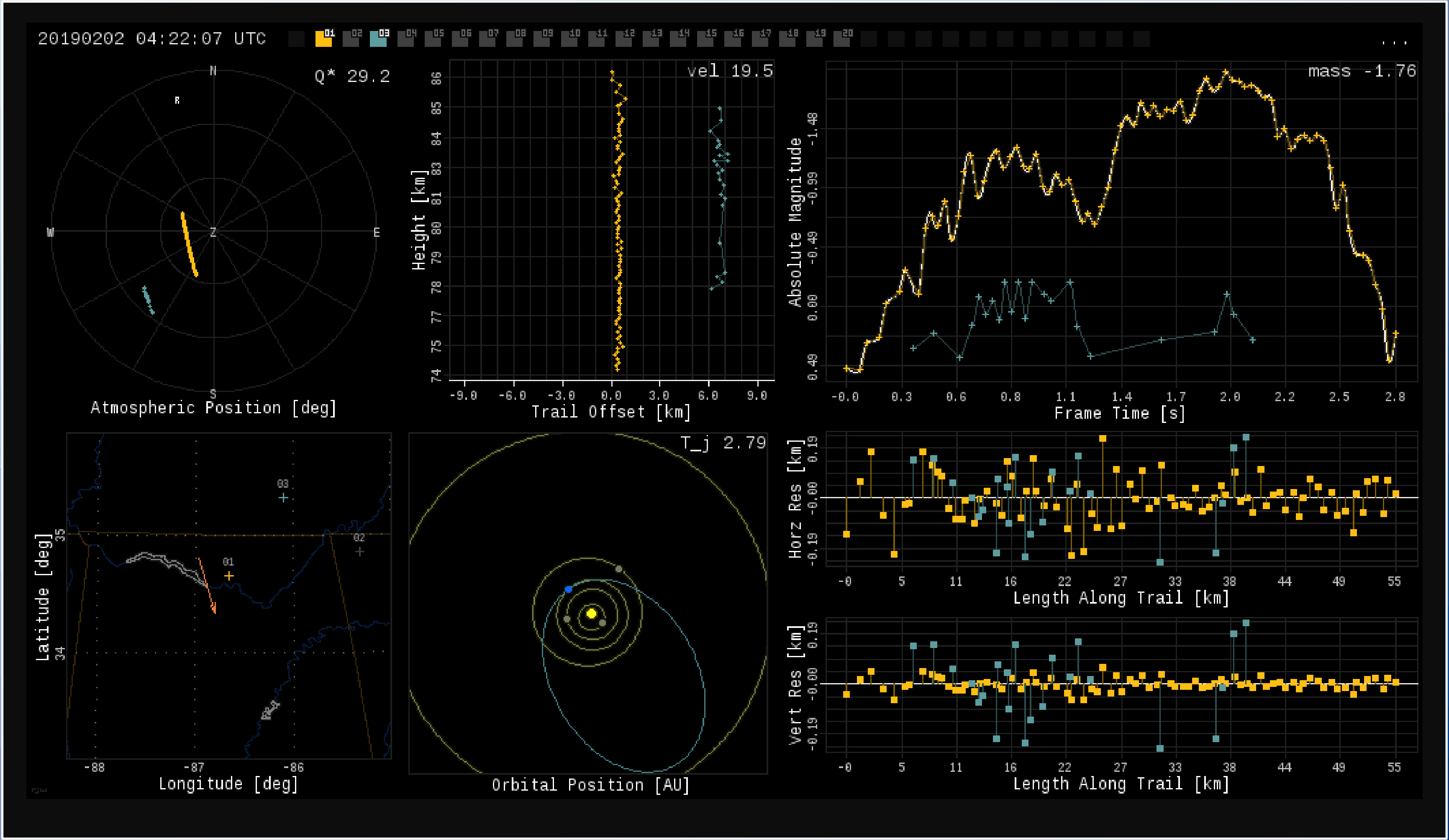

2011/09/28
04:31:53
120.0000s
Caigudes
000222287


B
c
York
Water
Camera
Elevation
Angle
A
distance to ground track
b
altitude
a
C
c
distance to ground track
b
Hankey
Telescope
Camera
Elevation
Angle
A



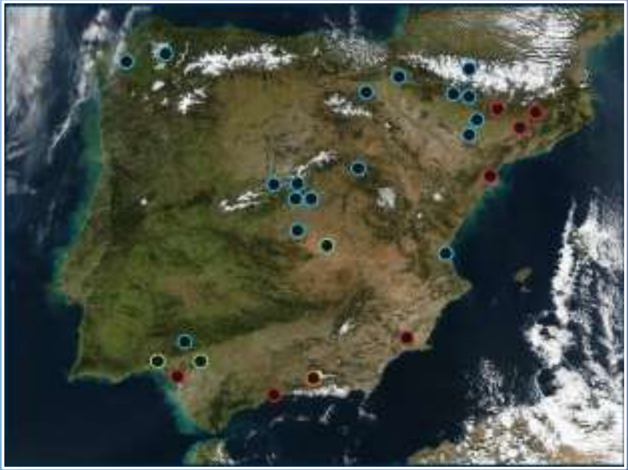

2010/10/09 00:55:33.538 UTC FOLGUEROLES_AAO_SPMN_W

NASA's All Sky Fireball Network



SPMN

RED DE INVESTIGACIÓN SOBRE BÓLIDOS Y METEORITOS



- **Bólido del 11 de diciembre de 2018 (SPMN111218, 1h37m32±1s T.U.C.)**

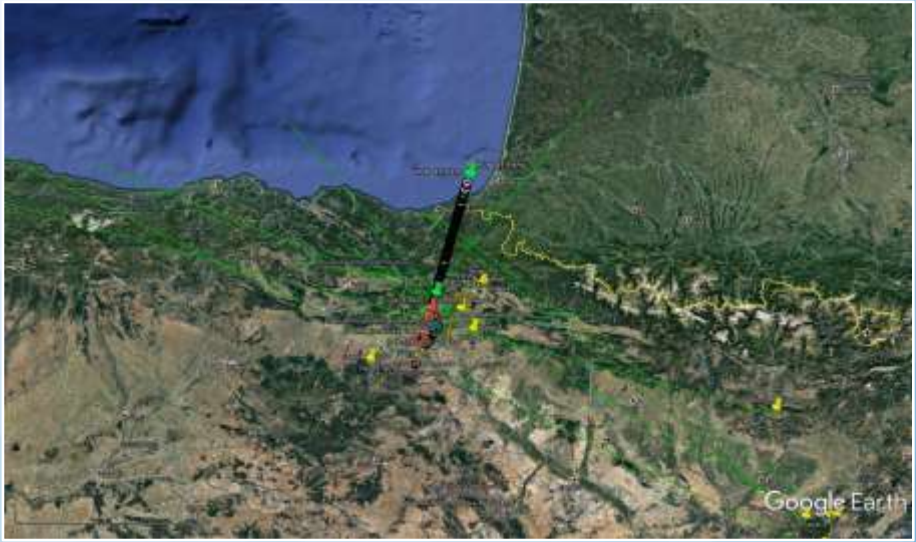
Registro: : Observatorios de Calar Alto, La Sagra, La Hita y la estación de Sevilla (J.M.Madiedo/UHU-USEV) y del Observatorio de La Murta (J.A. de los Reyes y S. Pastor).

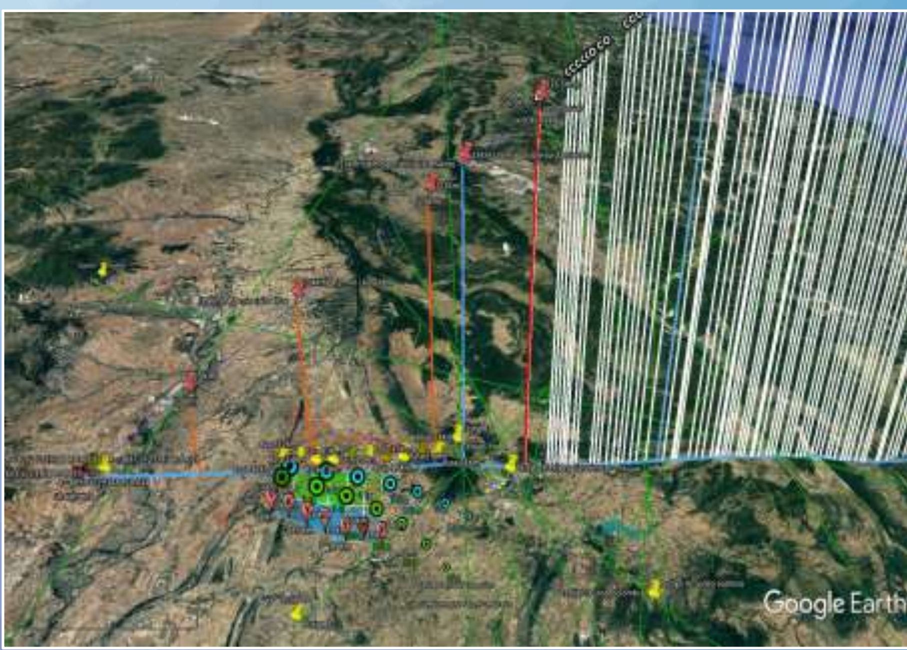
Magnitud absoluta: -8±1

Origen: Esporádico

Rango de observación: Andalucía, Aragón, Castilla-La Mancha, Comunidad Valenciana, Comunidad de Madrid y Región de Murcia.

El bólido SPMN111218 visto desde La Murta (J.A. de los Reyes y S. Pastor/SPMN).


Google Earth

Google Earth

Google Earth


Recerca sistemàtica

The accumulation rate of meteorite falls at the Earth's surface: The view from Roosevelt County, New Mexico

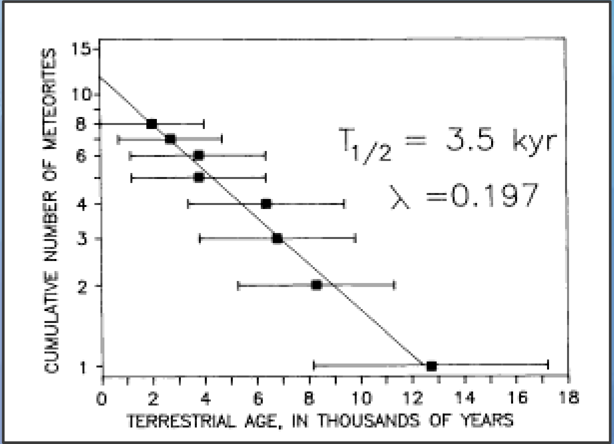
MICHAEL E. ZOLENSKY,[1] GORDON L. WELLS[2] AND HELEN M. RENDELL[3]

[1]Planetary Science Branch, NASA, Johnson Space Center, Houston, TX 77058
[2]School of Geography, University of Oxford, Mansfield Road, Oxford OX1 3TB, England
[3]The Geography Laboratory, University of Sussex, Brighton BN1 9QN, England

(Received 14 February 1989; accepted in revised form 25 September 1989)

Abstract—The discovery of 154 meteorite fragments within an 11 km² area of wind-excavated basins in Roosevelt County, New Mexico, permits a new calculation of the accumulation rate of meteorite falls at the Earth's surface.

Thermoluminescence dating of the coversand unit comprising the prime recovery surface suggests the maximum terrestrial age of the meteorites to be about 16.0 ka. The 68 meteorite fragments subjected to petrological analyses represent a minimum of 49 individual falls. Collection bias has largely excluded carbonaceous chondrites and achondrites, requiring the accumulation rate derived from the recovered samples to be increased by a factor of 1.25. Terrestrial weathering destroying ordinary chondrites can be modelled as a first-order decay process with an estimated half-life of 3.5 ± 1.9 ka on the semiarid American High Plains. Having accounted for the age of the recovery surface, area of field searches, pairing of finds, collection bias and weathering half-life, we calculate an accumulation rate of 9.4×10^2 falls/a per 10^6 km² for falls >10 g total mass. This figure exceeds the best-constrained previous estimate by more than an order of magnitude. One possible reason for this disparity may be the extraordinary length of the fall record preserved in the surficial geology of Roosevelt County. The high accumulation rate determined for the past 16 ka may point to the existence of periods when the meteorite fall rate was significantly greater than at present.



obtained for the accumulation rate over the past 16 ka for meteorites (falls) with total weights of at least 10 g:

$$C = 9.4 \times 10^2 \text{ falls/a per } 10^6 \text{ km}^2$$

A more complete understanding of the meteorite fall rate in relation to the total recovered fall mass can be obtained from a plot of these values for the data derived from the 49 Roosevelt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THE ANTARCTIC SEARCH FOR METEORITES
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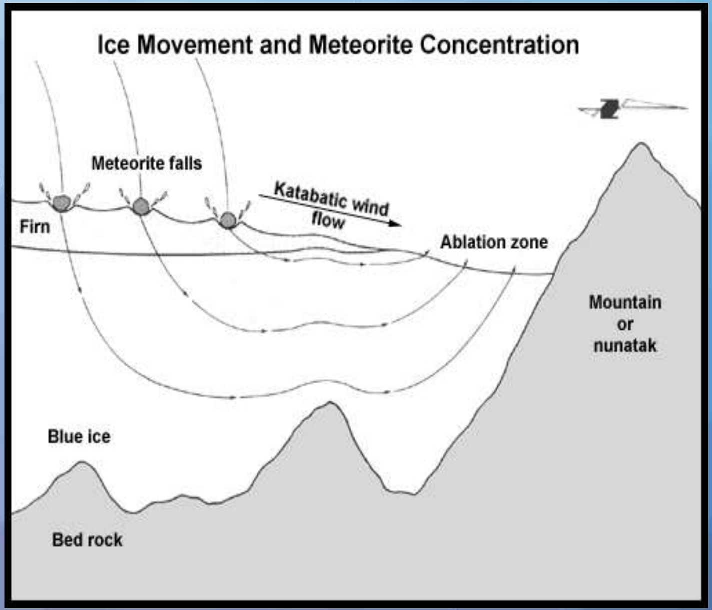

Ice Movement and Meteorite Concentration
Meteorite falls
Katabatic wind
flow
Firn
Ablation zone
Mountain
or
nunatak
Blue ice
Bed rock


100 KM


Isola d
Túnez


Zona 1
Zona 2
Zona 3
Zona 3B
Zona 4
Zona 5
Zona 5B
Zona 6
Zona 7
Zona 8
37 km


etrex
VISTA
GARMIN

2008

2015



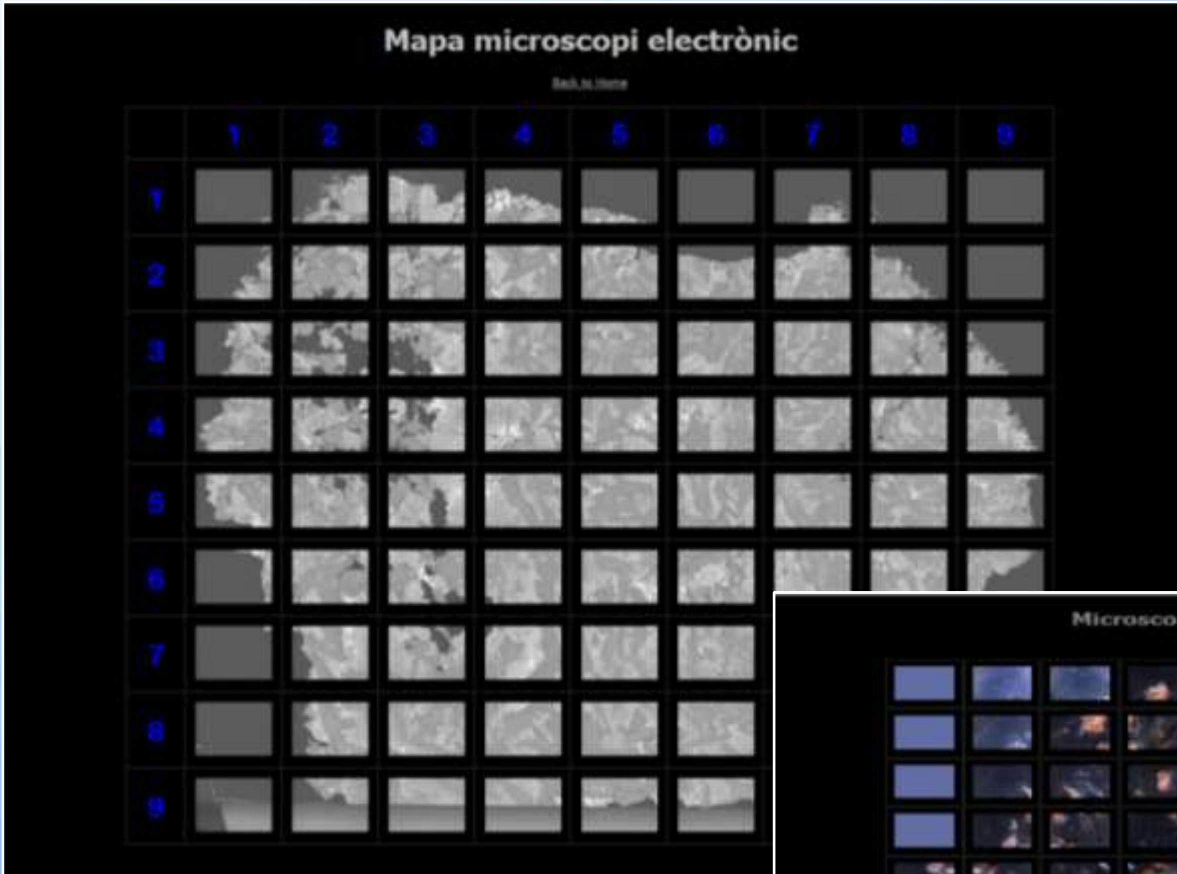


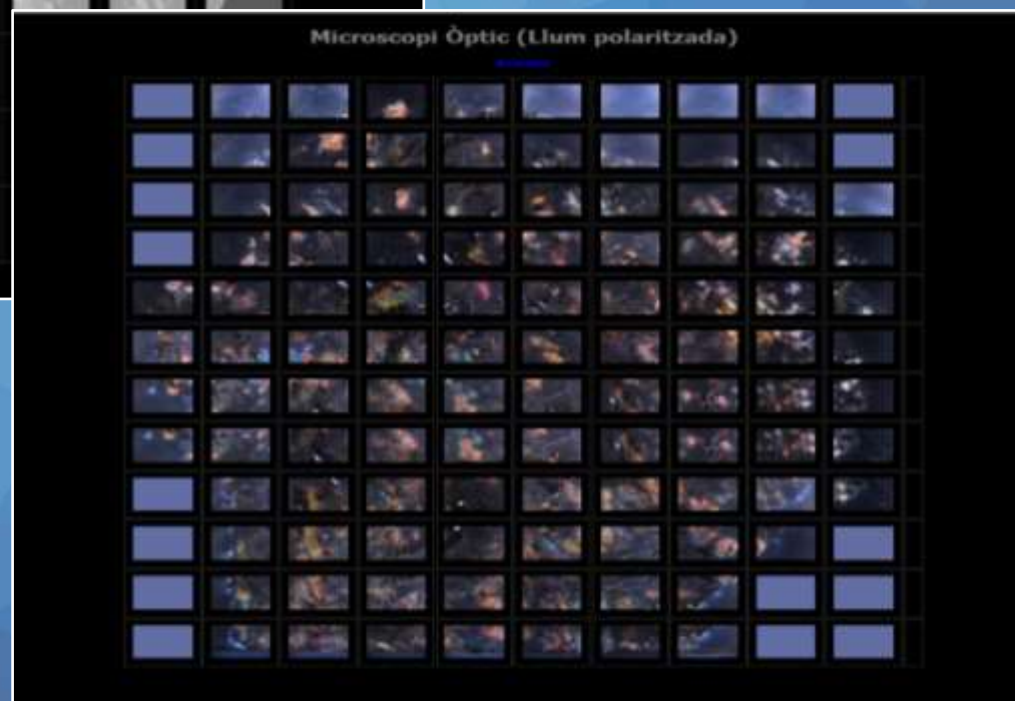

2m
2069m
GARMIN

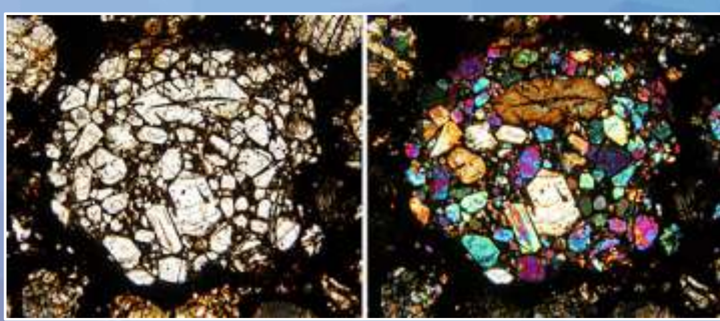
1 CM


Met-3-2010
100 m


N 32° 40.801'
E 009° 43.617'
2,1g


Mapa microscopi electrònic
1 2 3 4 5 6 7 8 9
1
2
3
4
5
6
7
8
9


Microscopi Òptic (Llum polaritzada)



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Years		Has strewnfield		
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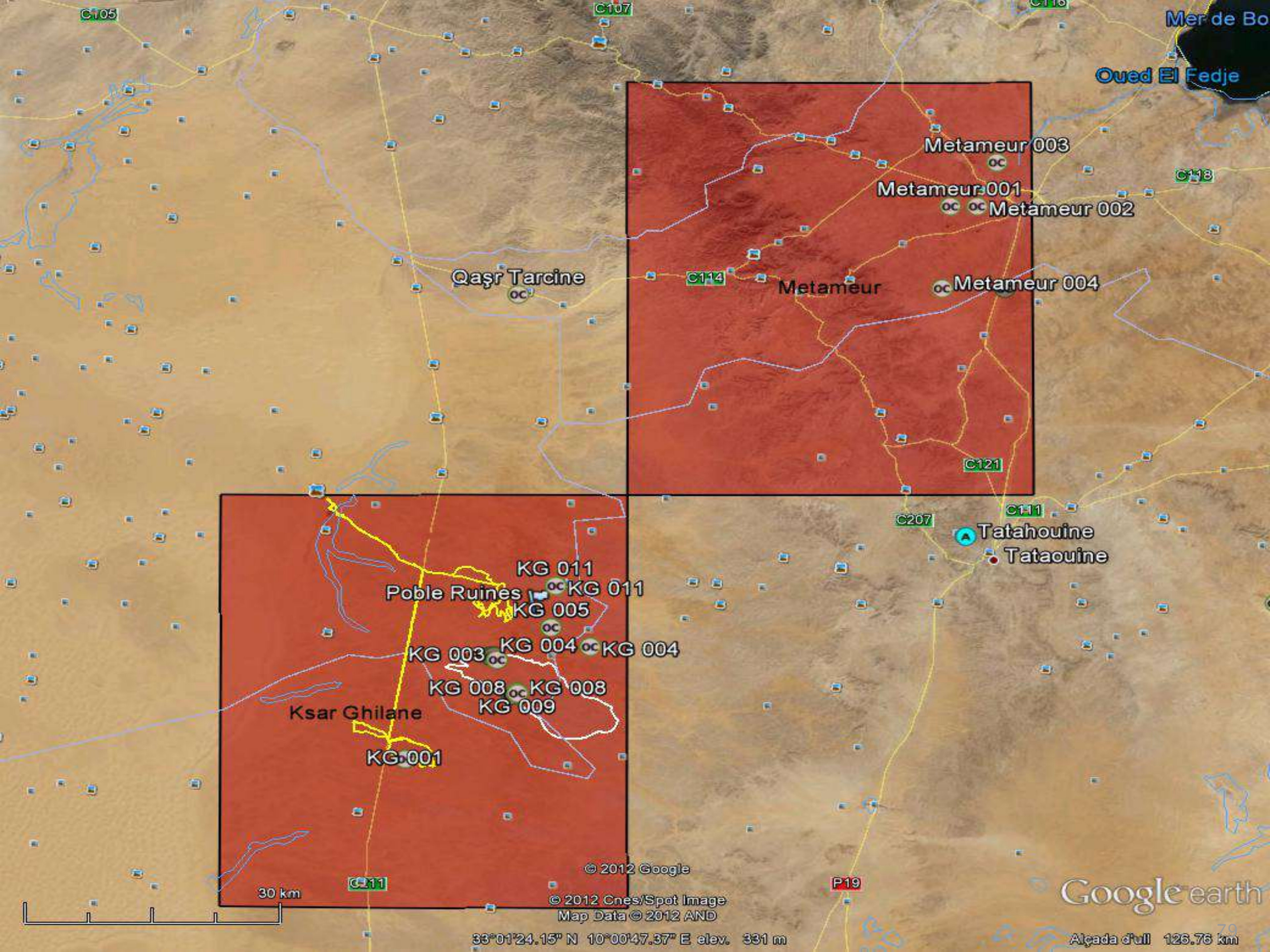
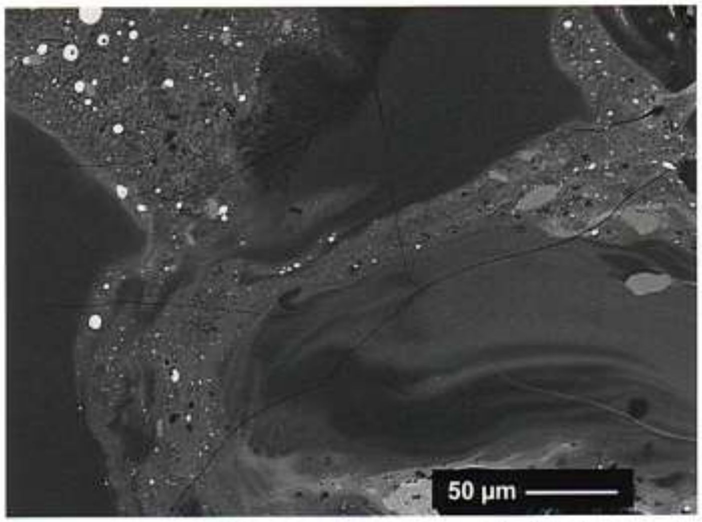
Los Vientos 250

Basic information	**Name:** Los Vientos 250 This is an OFFICIAL meteorite name. **Abbreviation:** LoV 250 **Observed fall:** No **Year found:** 2018 **Country:** Chile **Mass:** 98.8 g
Classification history:	**Recommended: Diogenite** [explanation] This is 1 of 418 approved meteorites classified as Diogenite. [show all] Search for other: Achondrites, Diogenites, and HED achondrites
Comments:	Approved 2 Dec 2018
Writeup	Writeup from MB 107: **Los Vientos 250** (LoV 250) 24°41.093'S, 69°50.533'W Antofagasta, Chile Find: 8 Feb 2018 Classification: HED achondrite (Diogenite) **Physical characteristics**: Single stone partially covered by fusion crust with flow lines. Sawn surface shows a yellowish-orange interior with abundant opaque grains and metal. **Petrography**: Thin section shows pyroxene (95 vol%) grains up to 6 mm in the long dimension with abundant shock veins. Chromite spinel grains (3 vol%) are well scattered through the sample and measure up to 3 mm and are usually associat polymorphs, FeS and Ti-spinel. **Geochemistry**: Low-Ca pyroxene composition in the range $Fs_{23.2\text{-}23.5}Wo_{0.9\text{-}1.2}$ (mean $Fs_{23.4\pm0.2}Wo_{1.0\pm0.2}$, N=8), with FeO/MnO=26.0±1.2. Mean olivine composition is $Fa_{35.3\pm0.2}$ (N=2). Chromite exhibits Cr/(Cr+Al) values of 0.82±0.05 (N=
Data from: MB107 Table 0 Line 0:	**State/Prov/County:** Antofagasta **Date:** 8 Feb 2018 **Latitude:** 24°41.093'S **Longitude:** 69°50.533'W **Mass (g):** 98.8 **Pieces:** 1 **Class:** Diogenite **Shock stage:** High **Weathering grade:** low **Classifier:** J. Llorca, UPC **Type spec mass (g):** 21 **Type spec location:** UPC **Main mass:** David Allepuz **Finder:** David Allepuz-José Vicente Casado-Javier Alvarez **Comments:** Field name: Met-2018-007; submitted by David Allepuz
Institutions	UPC: Institut de Tècniques Energètiques, Universitat Politècnica de Catalunya Diagonal 647, ed. ETSEIB, 08028 Barcelona, Spain, Spain (institutional address; updated 3 May 2015)


C105
C107
C118
Mer de Bo
Oued El Fedje
Metameur 003
Metameur 001
Metameur 002
C118
Qaşr Tarcine
C114
Metameur
Metameur 004
C121
C111
C207
Tatahouine
Tataouine
KG 011
KG 011
Poble Ruines
KG 005
KG 003
KG 004
KG 004
KG 008
KG 008
KG 009
Ksar Ghilane
KG 001
© 2012 Google
30 km
C211
P19
© 2012 Cnes/Spot Image
Map Data © 2012 AND
33°01'24.15" N 10°00'47.37" E elev. 331 m
Google earth
Alçada d'ull 126.76 km

METEORITICS & PLANETARY SCIENCE

Volume 48 | Number 3 | 2013 March



A BSE image of a large schlieren-like melt structure found in the Ksar Ghilane 002 shergottite.

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Meteoritics & Planetary Science 1–21 (2013)
doi: 10.1111/maps.12074

The Ksar Ghilane 002 shergottite—The 100th registered Martian meteorite fragment

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[*]Corresponding author. E-mail: jordi.llorca@upc.edu

4 campanyes a Tunísia

9 meteorits nous
12.722 grams
231 exemplars
1 nova area de distribucio

1 meteorit de Mart

6 campanyes a Xile

325 meteorits nous
91300 grams
980 exemplars
2 el·lipsis de caiguda

1 carbonàcia
2 metal·lics
2 ureilites
2 diogenites

Classif	
H	115
L	173
LL	50
CI	0
CM	2
CB	1
CV	21
CO	13
CK	7
CR	0
CH	0
EH	0
EL	7
R	7
K	0
ACA	2
LOD	2
WIN	5
SHE	12
NAK	7
CHA	2
MAR-BB	0
OPX	0
LUN-IB	6
LUN-MB	0
HOW	7
EUC	18
DIO	15
ANG	10
BRA	8
AUB	10
URE	9
MS	9
PAL-GP	2
PAL-ES	0
PAL-PX	0
ATX	2
I	17
II	2
III	3
IV	5
UNG	1
	0
	550

Tipus	
COND	401
ACOND	126
METAL	37
MET-ROC	19
NO-MET	2
	585

Trobat/caigut	
Trobat	179
Caigut	46
	225

Alteració/Sub.	
1	0
2	2
3	30
3.0	3
3.1	0
3.15	0
3.2	18
3.3	2
3.4	0
3.5	4
3.6	4
3.7	2
3.8	9
3.9	6
4	108
5	155
6	53
7	4
A	24
B	3
C	0
D	0
E	0
F	0
G	0
	427

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Col·lecció de meteorits

620 exemplars

Preguntes ?

Moltes gràcies

i

a tocar meteorits!