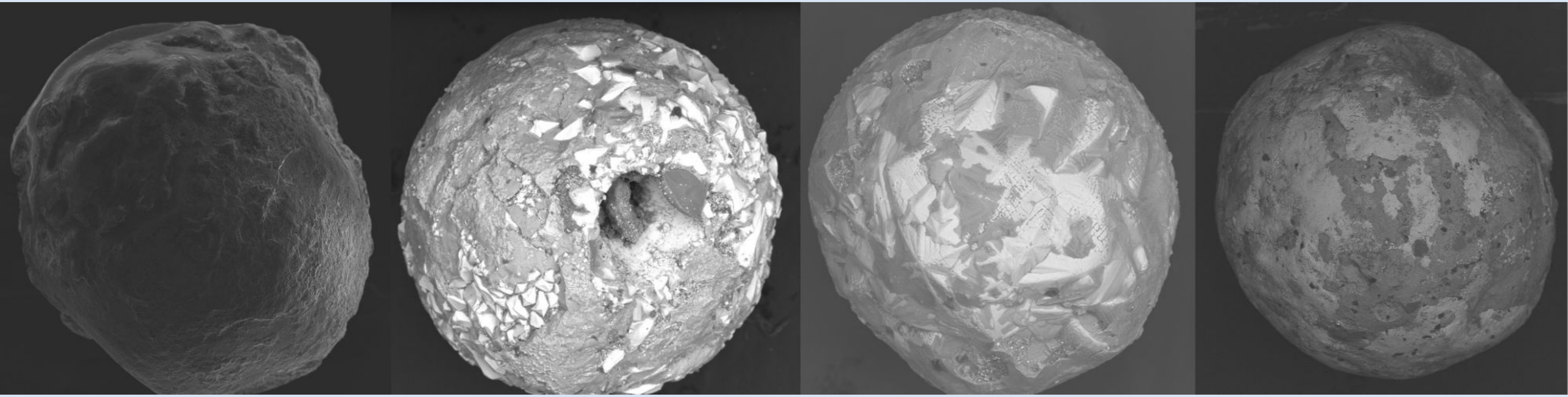
Utilizing Microspherules as Evidence for Extraterrestrial Impacts



Wesley Brown

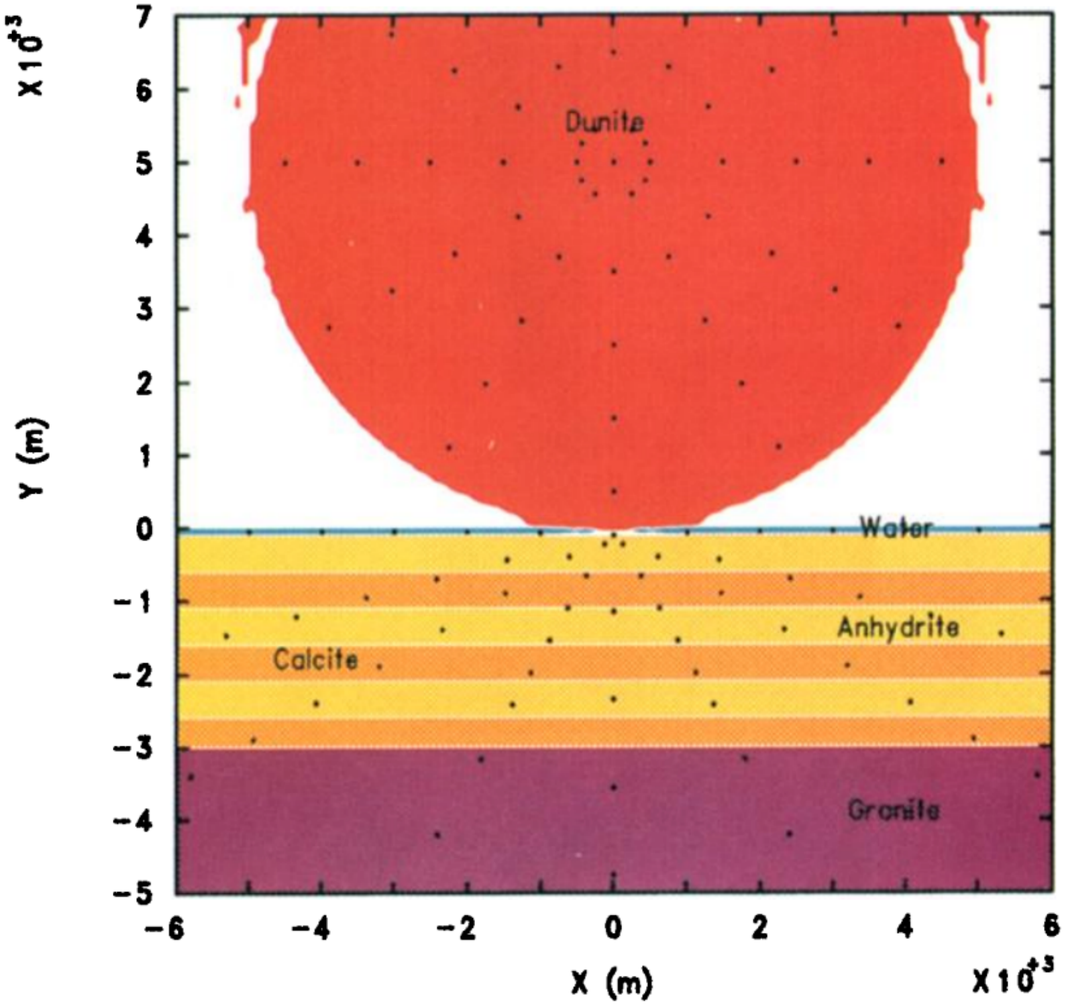


Plate 1. Modeled target lithologies, representing the simulation at the instant a 10-km projectile contacts the surface (the simulation starts with the projectile at 25 km from the surface). The tracers are shown as asterisks in both the target and the projectile. Various colors are used to represent the various materials, as indicated.

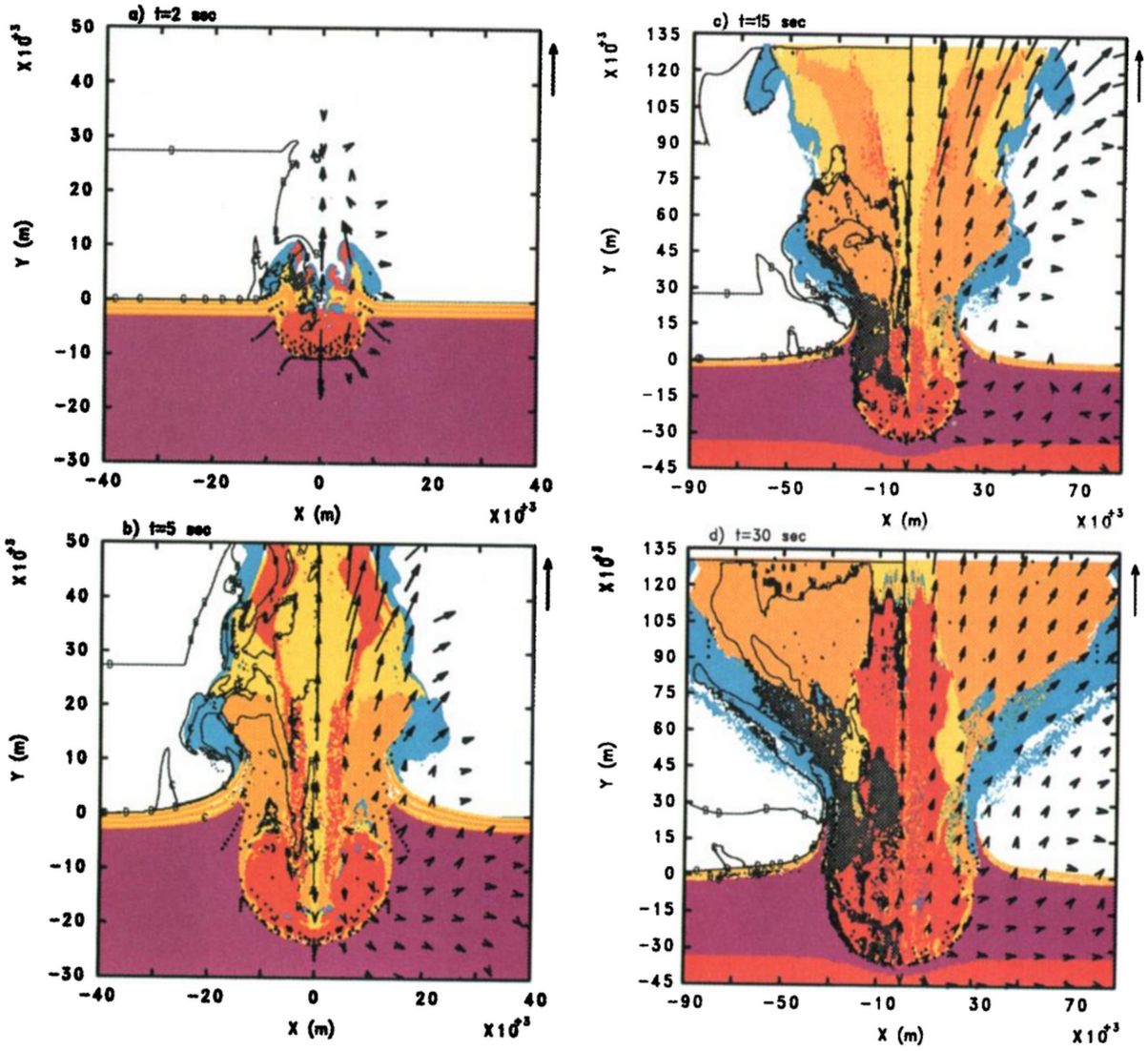
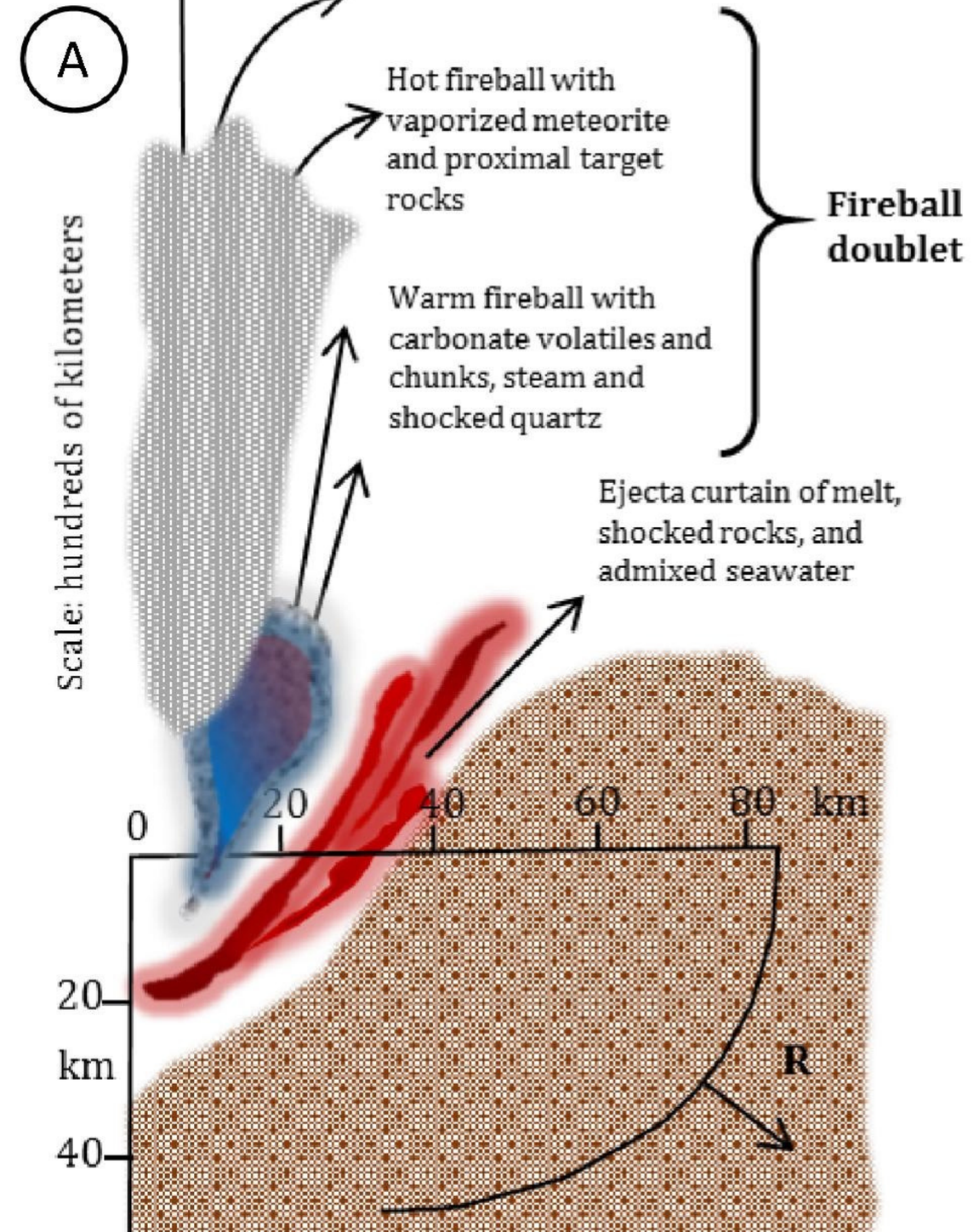
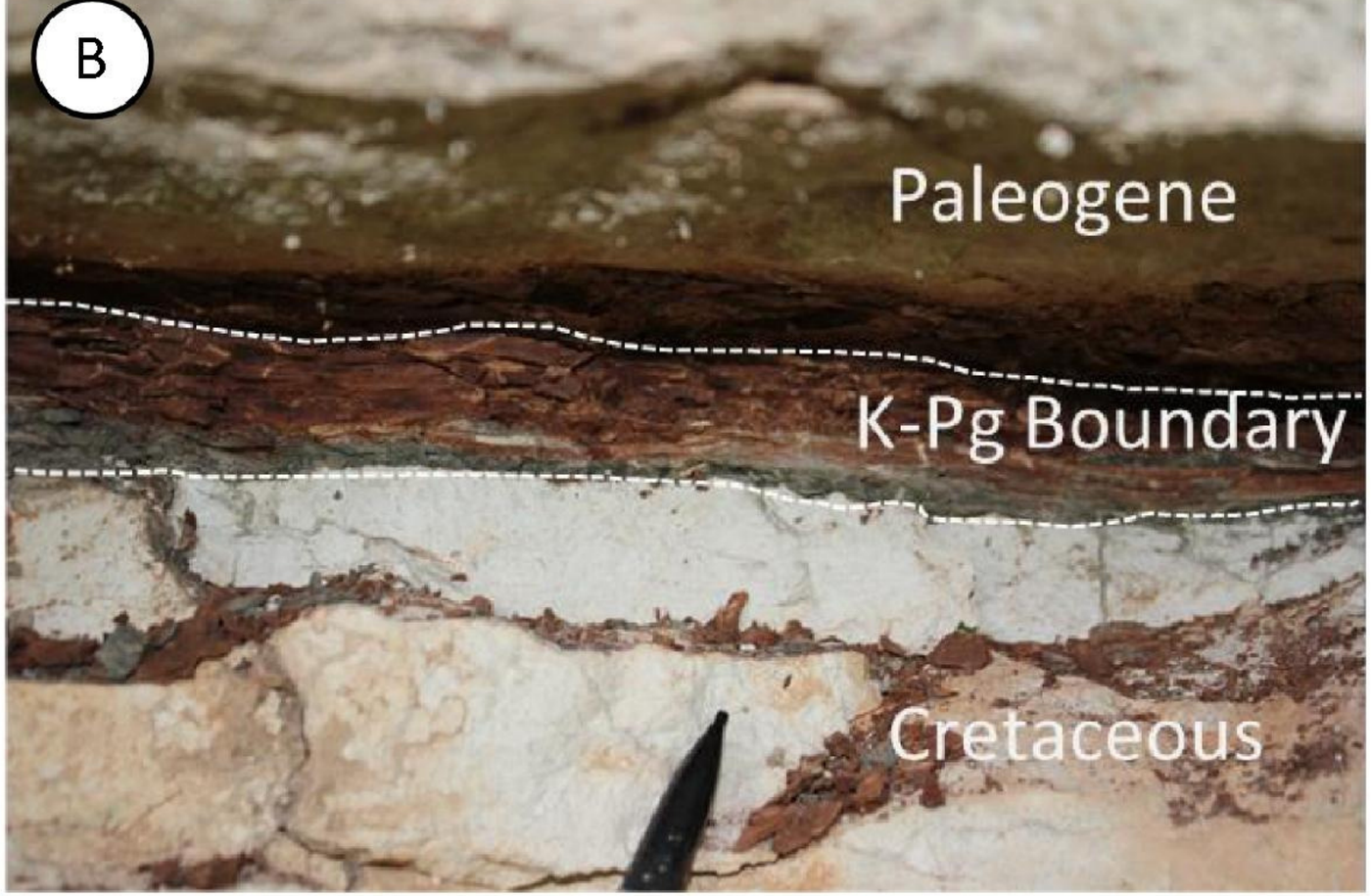
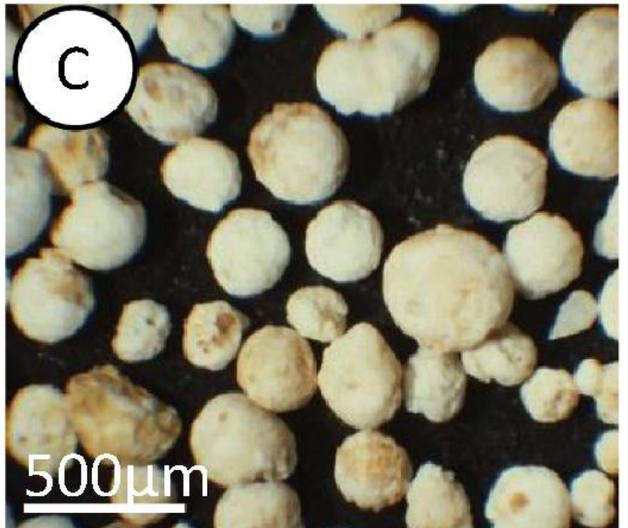
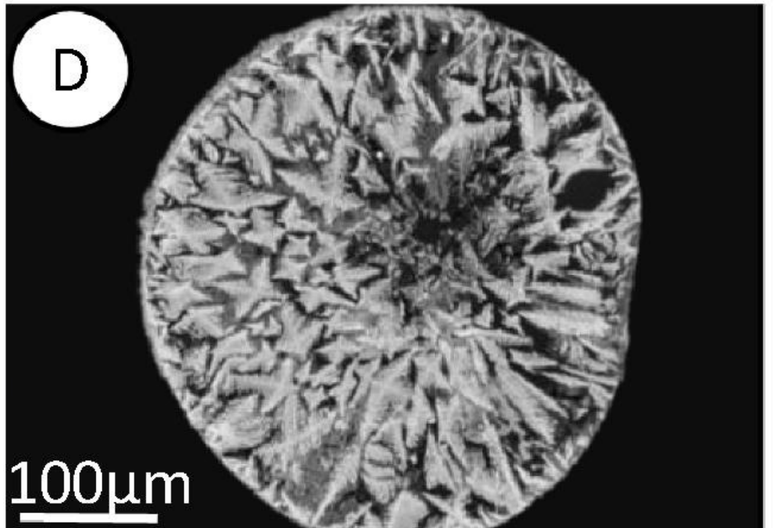


Plate 2. Axially symmetric outputs from the hydrocode simulations at (a) 2, (b) 5, (c) 10, and (d) 30 s after the impact. At left are velocity vectors, whose length is proportional to the velocity of the material. For reference, a vertical vector, representing a speed of 5 km/s, is plotted at right of each diagram. On right are density contours. Colors are same as in Plate 1.


A
Hot fireball with vaporized meteorite and proximal target rocks
Warm fireball with carbonate volatiles and chunks, steam and shocked quartz
Fireball doublet
Ejecta curtain of melt, shocked rocks, and admixed seawater
Scale: hundreds of kilometers
0
20
40
60
80
km
20
km
40
R


B
Paleogene
K-Pg Boundary
Cretaceous

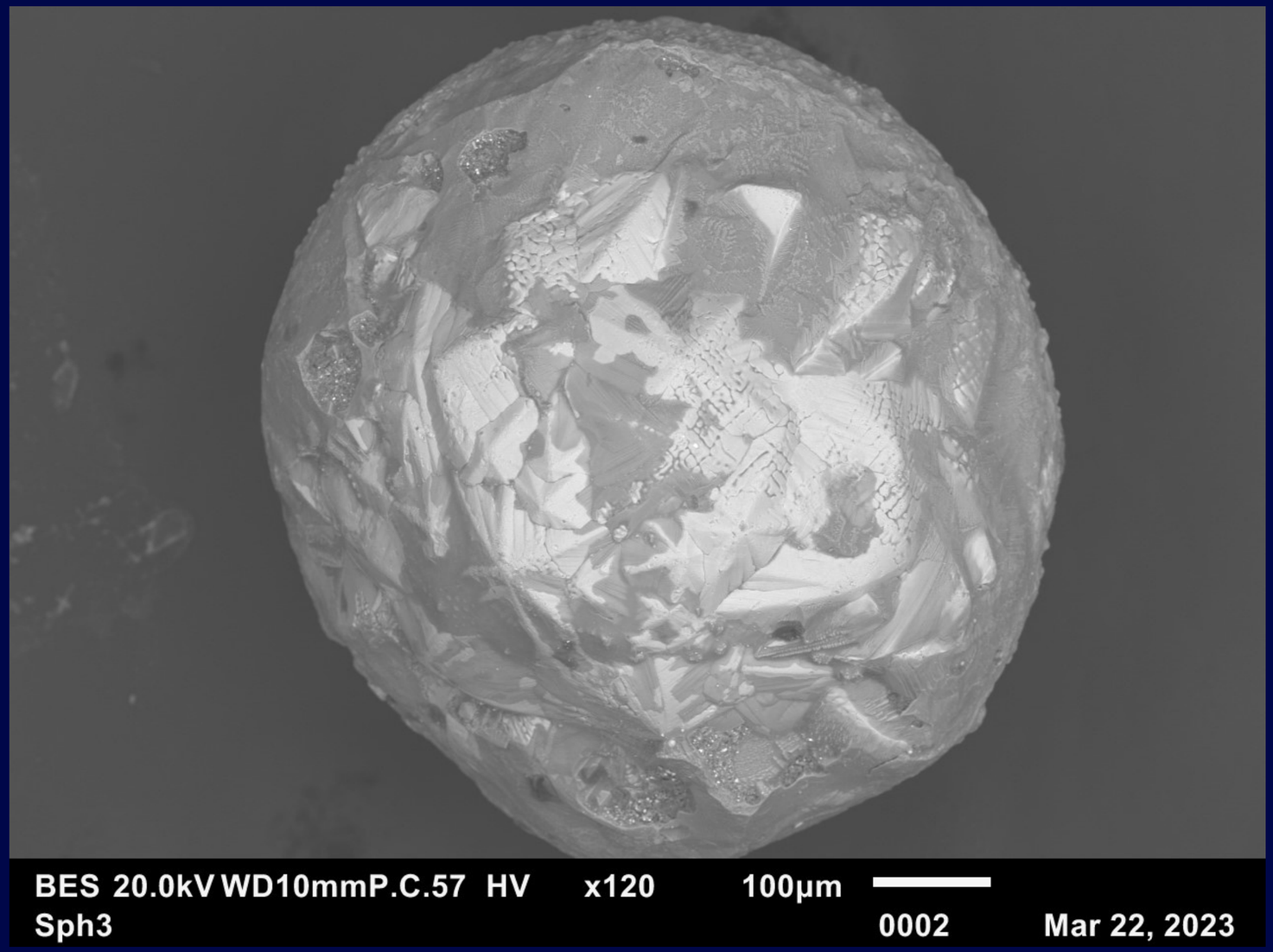

C
500µm


D
100µm

DISTANCE CLASSIFICATION

DISTRIBUTED MICROSPHERULES HOLD MORE SIGNIFCANCE

Often distributed far beyond the ejecta blanket. In the case of the Chicxulub impact, microspherules cover an area ~5500 times the area of the source crater. Distributed across continents. Ultimately, *a key indicator of the level of catstrophe.*



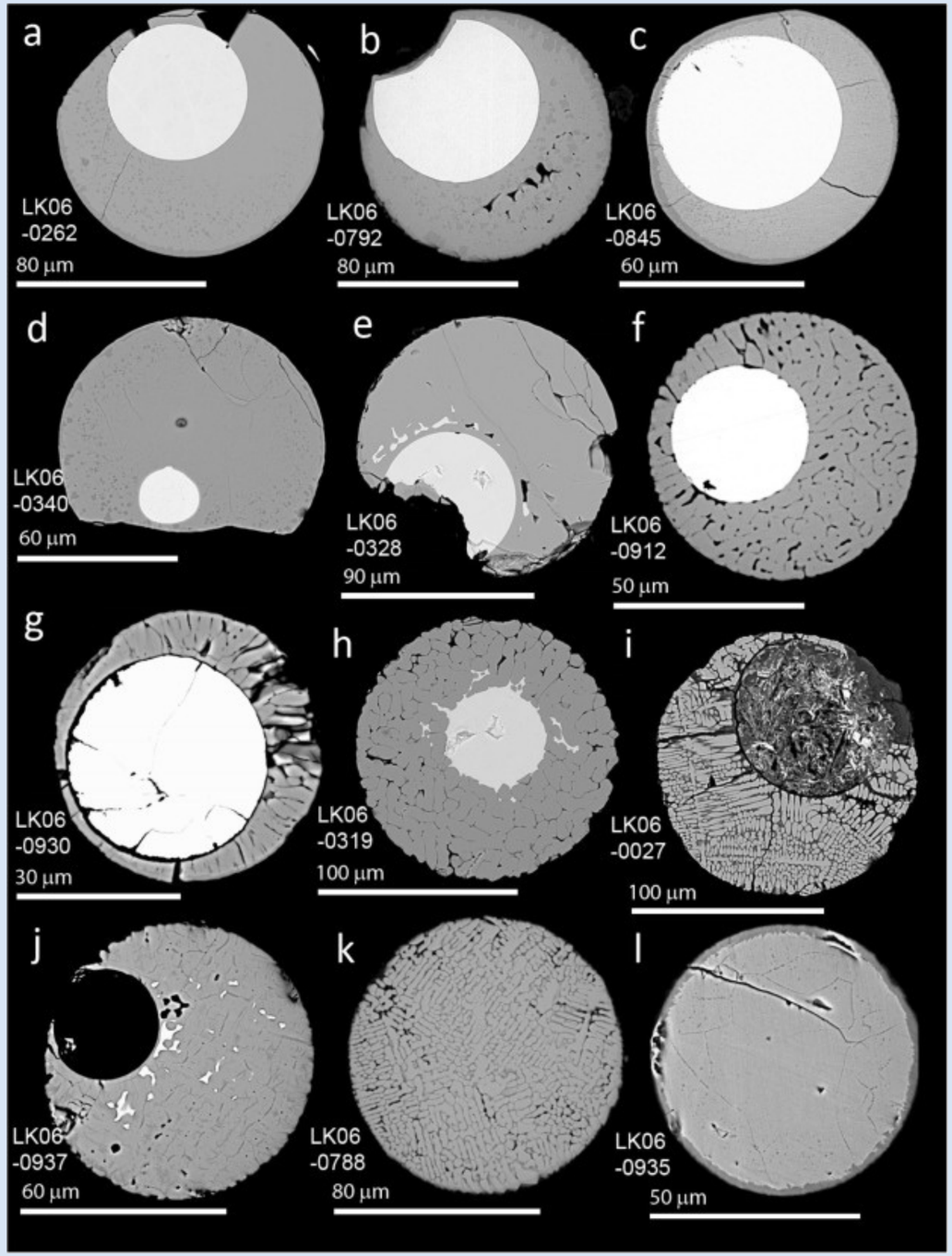
GEOCHEMICAL CLASSIFICATION

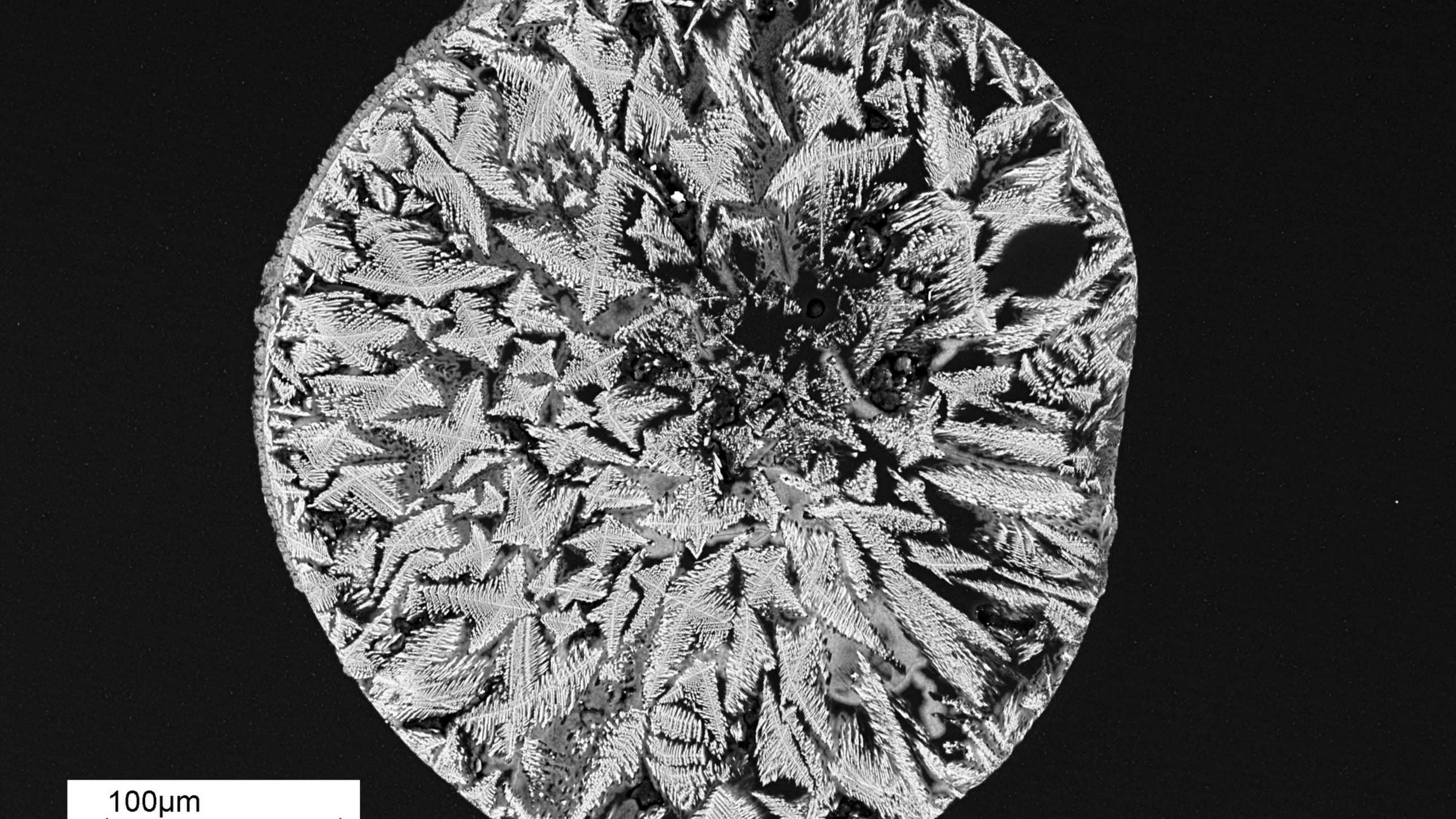
I–TYPE SPHERULES

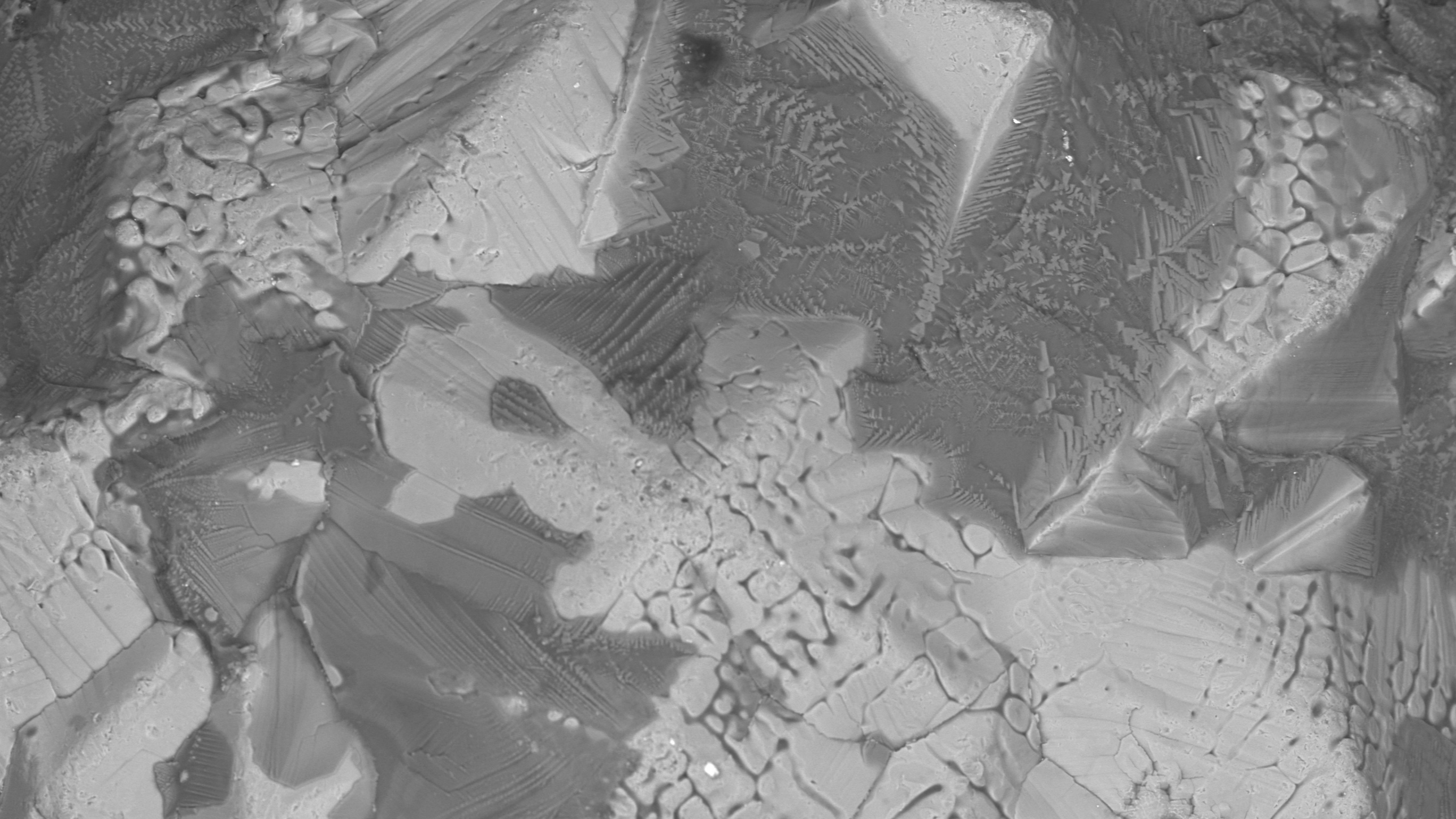
Consist of Fe oxides with a Fe-Ni core. Some are metallic Fe-Ni and devoid of an outer oxide coating.

G–TYPE SPHERULES

G-type spherules consist of a silicate matrix with crystals and dendrites of Fe oxides accompanied by Ni, Cr and Mg.



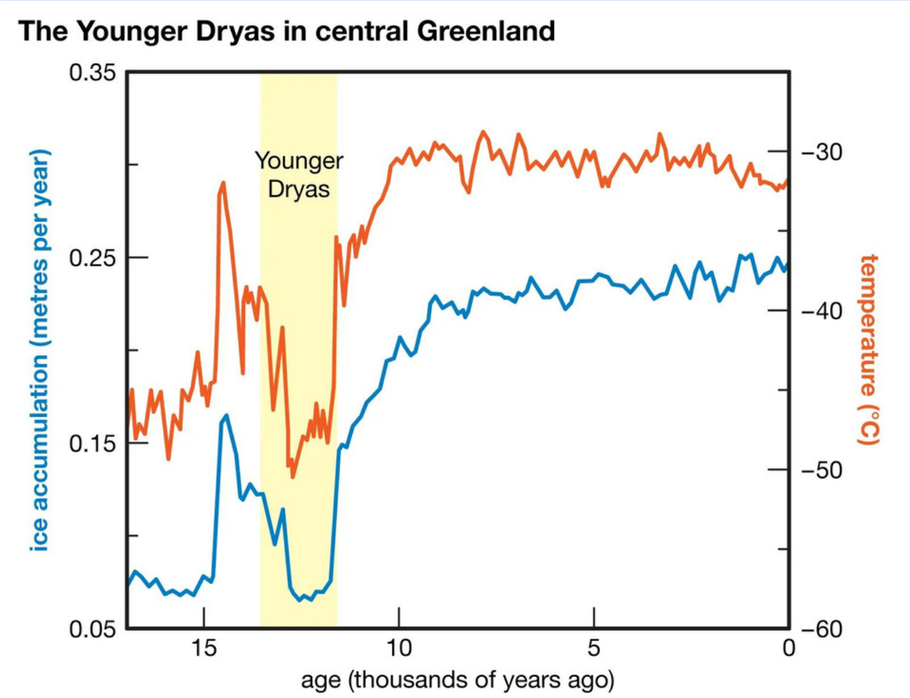

100μm

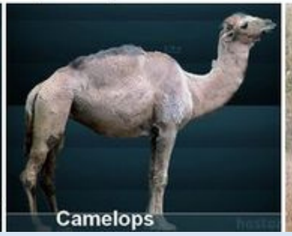


THE YOUNGER DRYAS

A well documented cooling event abruptly occurred during the warming period that followed the Late Glacial Maximum.

Often considered the nail in the coffin for NA Megafauna.





WHAT WE KNOW


WISCONSIN GLACIATION
Approximately from 100,000 to 11,000 years ago
Laurentide Ice Sheet
Cordilleran Ice Sheet
Greenland Ice Sheet
Sea ice
Modern international boundaries
Modern state/province boundaries
60° N
ASIA
75° N
150° W
120° W
90° W
60° W
ARCTIC OCEAN
GREENLAND
ICELAND
BERING SEA
BEAUFORT SEA
Baffin Bay
Arctic Circle
LABRADOR SEA
Hudson Bay
45° N
NORTH AMERICA
PACIFIC OCEAN
ATLANTIC OCEAN
SOURCES:
Physical Geology by Steven Earle, 2019.
"An Outline of North American Deglaciation with Emphasis on Central and Northern Canada" by Arthur S. Dyke in Developments in Quaternary Science, 2004.
0 250 500 mi
0 400 800 km
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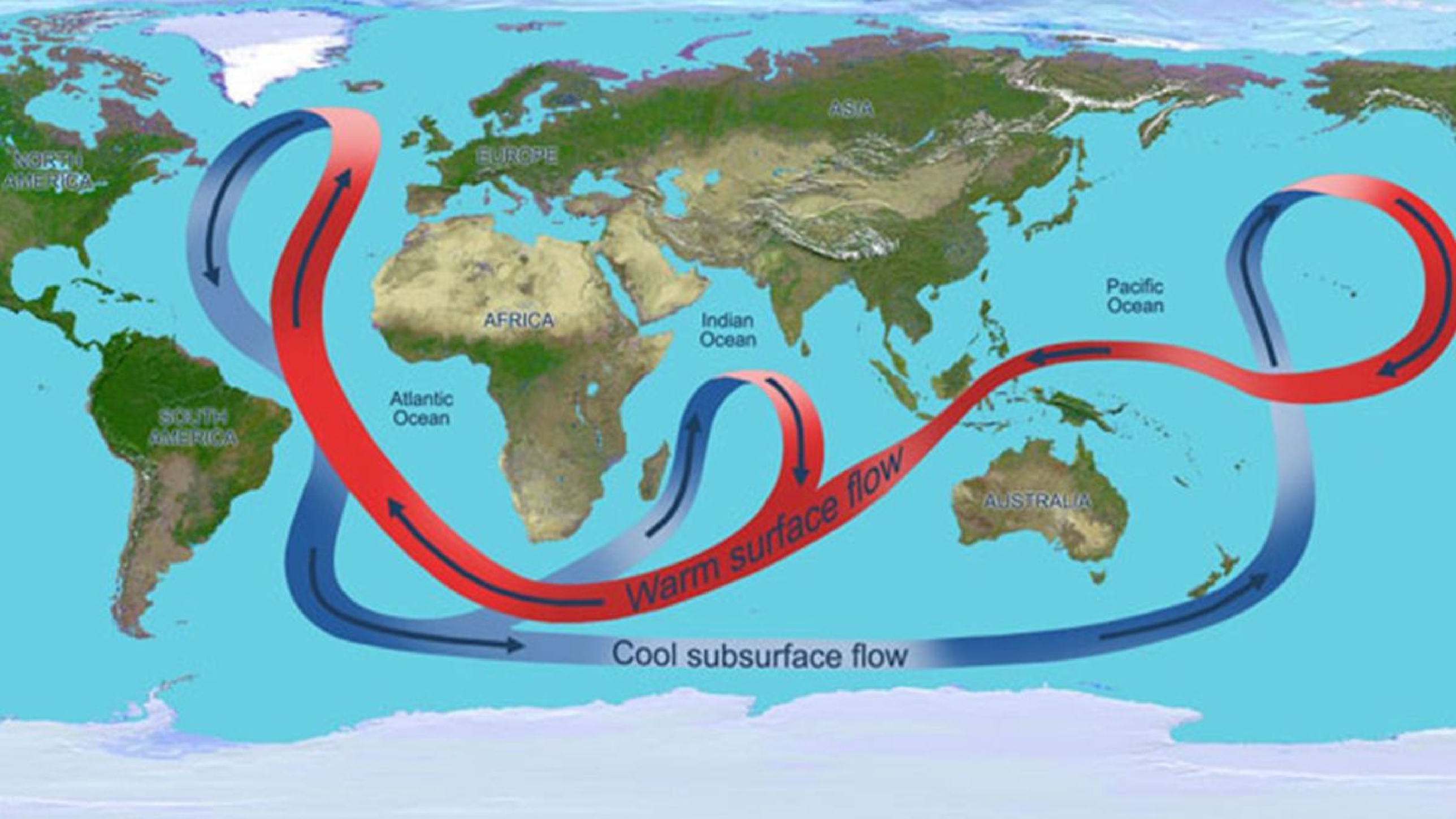
Lake Agassiz
Manitoba
Saskatchewan
LAKE AGASSIZ
Ontario
MT
ND
MN
SD

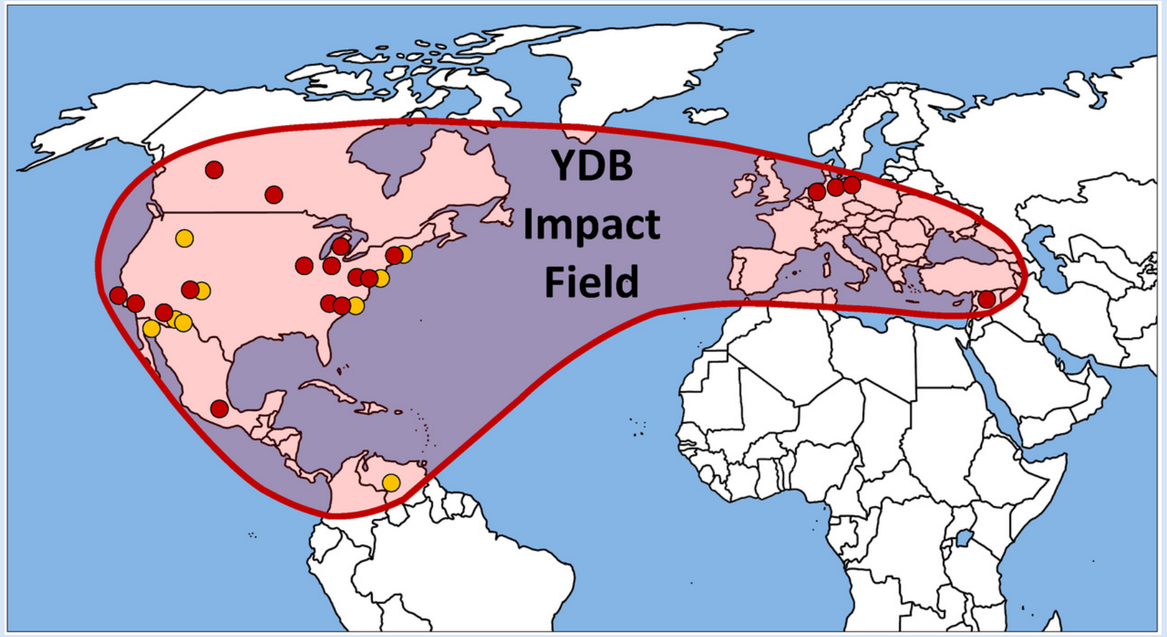

NORTH AMERICA
EUROPE
ASIA
AFRICA
Indian Ocean
Pacific Ocean
SOUTH AMERICA
Atlantic Ocean
AUSTRALIA
Warm surface flow
Cool subsurface flow

THE MAJOR EVIDENCE

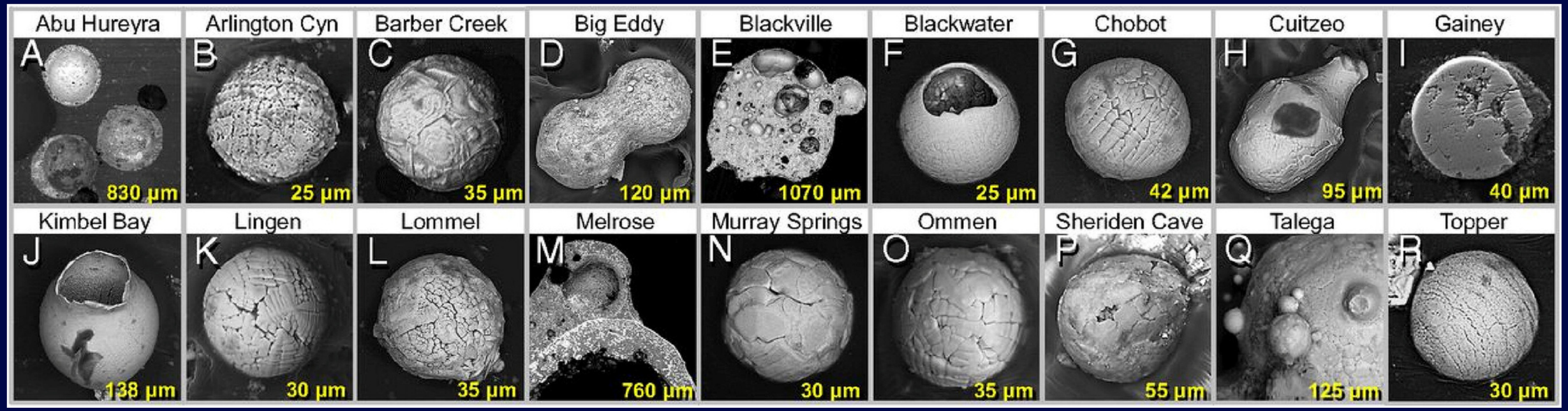
YDB Layer consists of "Black mats", or strata of organic-rich soil that represents a bio-mass burning episode.

YDB has been identified at about 50 archaeological sites across North America. Proven through modeling and statistical analysis to be synchronous.

PGE rich content just below the black mat.



Accompanied by a plethora of microspherules.



Specimens from 18 seperate sites shown here

There is still much work to do, but the spherules have withstood very strenious testing.

THANK YOU!

A list of references is available upon request

METEORITE SAMPLES PROVIDED BY THE UTD METEORITE RESEARCH AND EDUCATION LAB