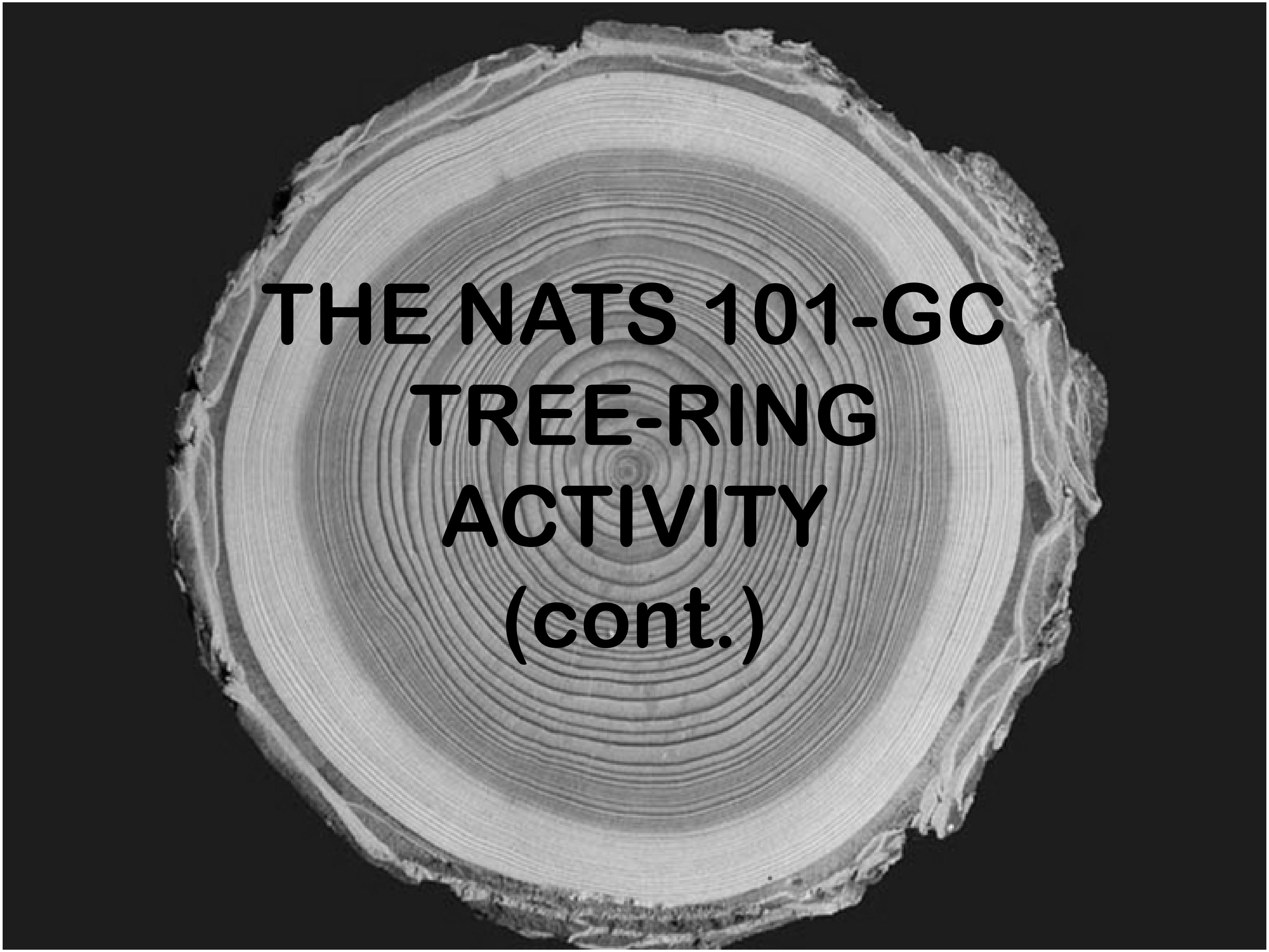
THE NATS 101-GC TREE-RING ACTIVITY (cont.)



PART A: SITE DESCRIPTIONS

PART B: COLLECTING DATA & ANALYZING YOUR SITE

PART C: SITE-TO-SITE COMPARISONS

PART D: DEVELOPING & TESTING HYPOTHESES

PART A:

BRISTLECONE PINE SITE DESCRIPTIONS

To fill in Table

CLASS NOTES pp129 - 130

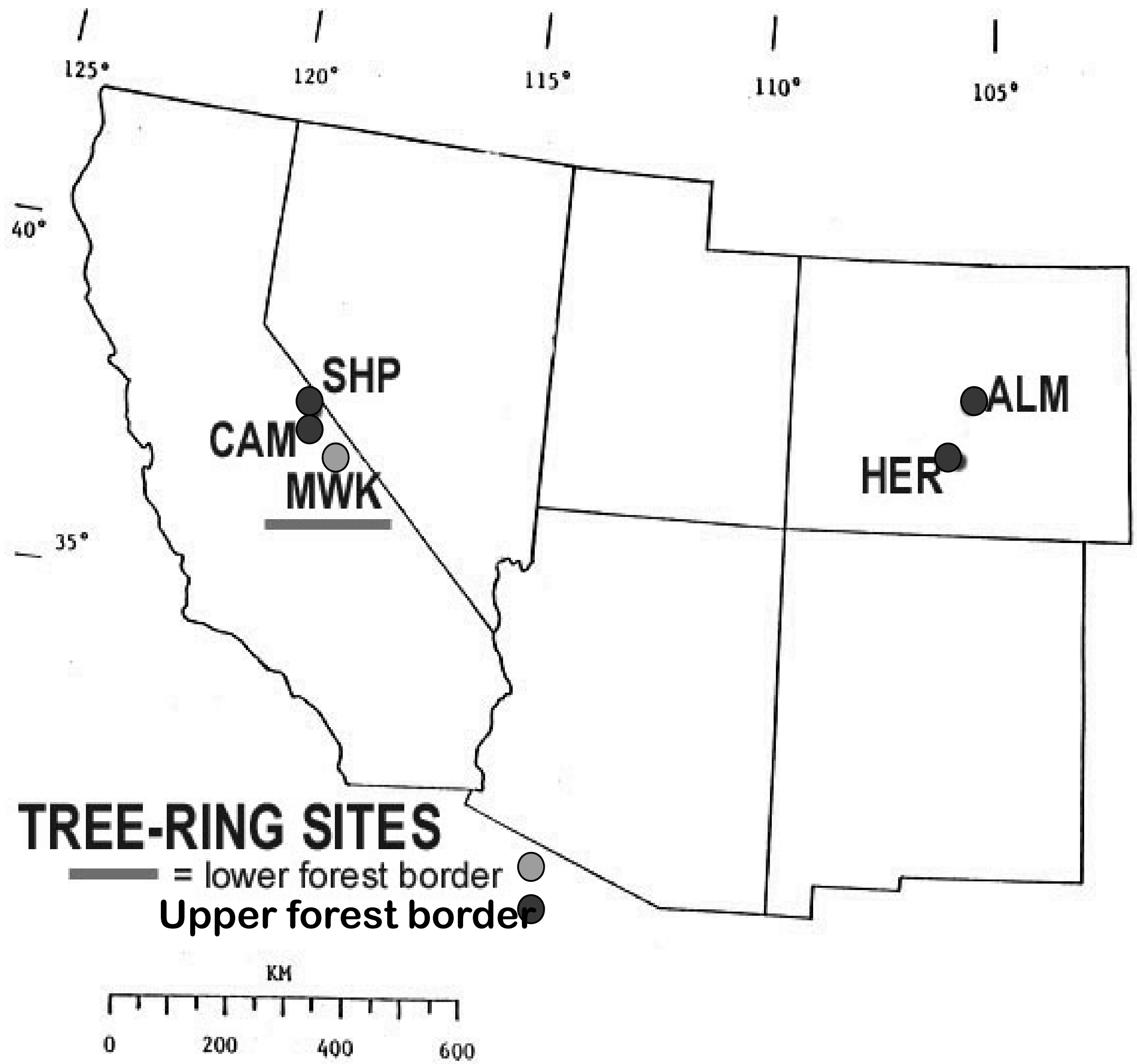
OBSERVATION TABLE (p 130 of Class Notes)

VARIABLES *(NOTE: A variable is something that varies from site to site or from time to time at one or more sites)*	OBSERVATION TABLE: SITE-to-SITE COMPARISONS				
	Sheep Mt Core ID = C	Campito Mt Core ID = D	Methuselah Walk Core ID = B	Almagre Mt Core ID = E	Hermit Lake Core ID = A
Geographic Location					
Elevation					
Upper or Lower Forest Border?					
Moisture- or Temperature- sensitive?					
Rock / soil type					
# of frost rings in entire record Any differences in # of frost rings over time?					
Trends in the time series of the ring width indices?					
Pre- & post 1900 differences?					
Other observations or things you noticed at each site?					

5 SITES IN WESTERN U.S.

All are Bristlecone Pine sites

SITE NAME (abrev)	CORE ID
Sheep Mt (SHP)	C
Campito Mt (CAM)	D
Methuselah Walk (MWK)	B
Almagre Mt (ALM)	E
Hermit Lake (HER)	A



Map on p 129

Upper & Lower Forest Border:

Temperature-sensitive and Precipitation-sensitive Trees

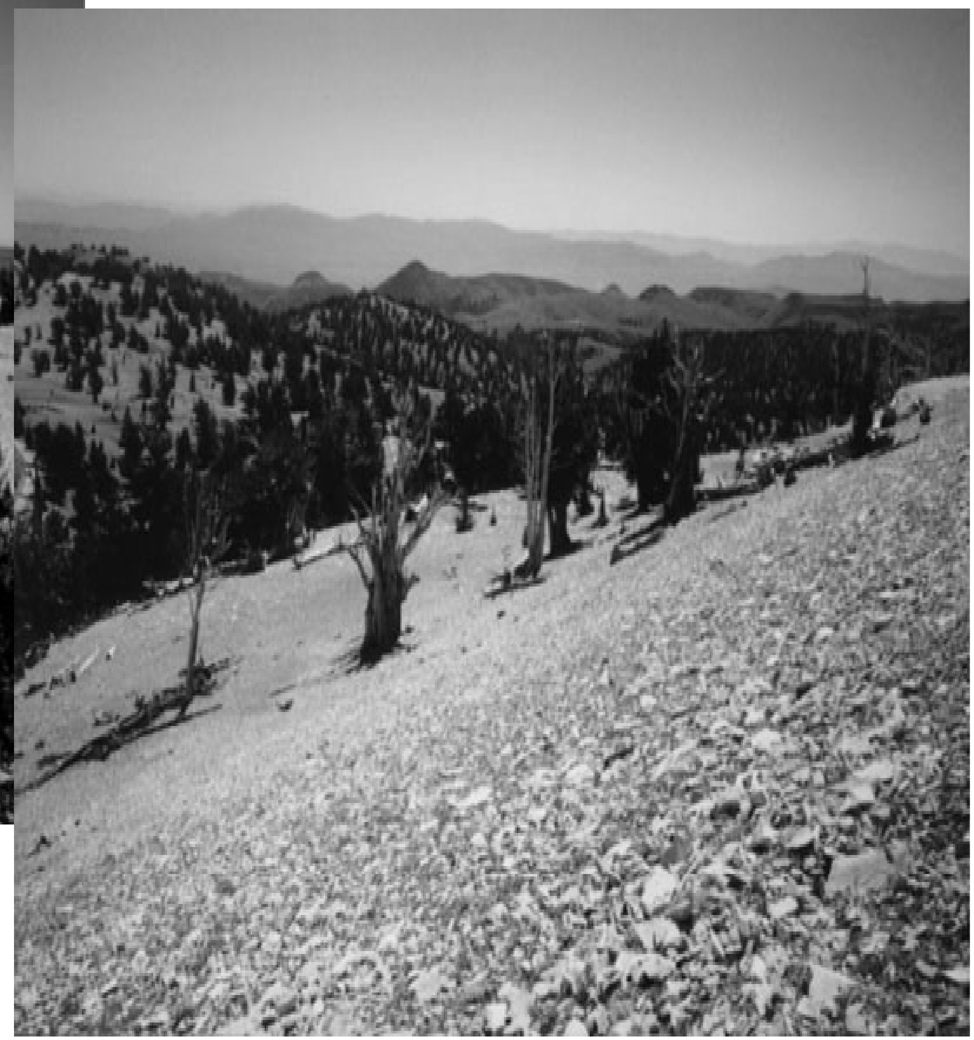
Take notes
p 130 Table

SITE 1 (SHP) SHEEP MT, Inyo Range, California

- In the White Mountains near Bishop, California
- Elevation - 3475 meters (~11,500 ft)
- Rock type - dolomite

Take notes
p 130 Table

SHEEP MT



SHEEP MT

SITE 2 (CAM) CAMPITO Mt

- White Mts. Near Bishop California
- Elevation - 3400 meters (~11,000 ft)
- Rock type - sandstone

Take notes
p 130 Table

CAMPITO MT

CAMPITO MT

SITE 3 (MWK) METHUSELAH WALK

- In White Mts near Bishop California
- Elevation - 2805 meters (~ 9200 ft)
- Rock type - Dolomite

Take notes
p 130 Table

METHUSELAH WALK

METHUSELAH WALK

SITE 4 (ALM)
Almagre Mt

- located in the Front Range of the Colorado Rockies
- Elevation - 3536 meters (~11,600 ft)
- Rock type - granite

Take notes
p 130 Table

ALMAGRE MT

ALMAGRE MT

SITE 5 (HER)
HERMIT LAKE

- located in the Front Range of the Colorado Rockies
- Elevation – 3657 meters (~ 12,000 ft)
- Rock type - sandstone

Take notes
p 130 Table

HERMIT LAKE

HERMIT LAKE

PART B

COLLECT DATA: (from BCP cores) by plotting skeleton plots, pattern matching, & crossdating

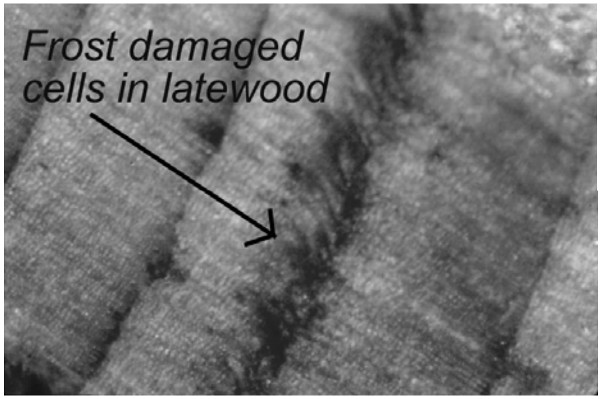
➔ ANALYZE DATA: (for your site) By carefully examining core data, skeleton plots, masters, and tree-ring index plots.

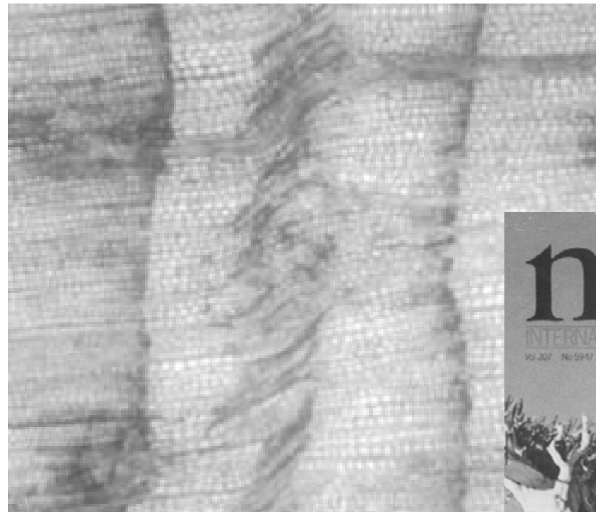
Go to: WORKSHEET PART B (p131)

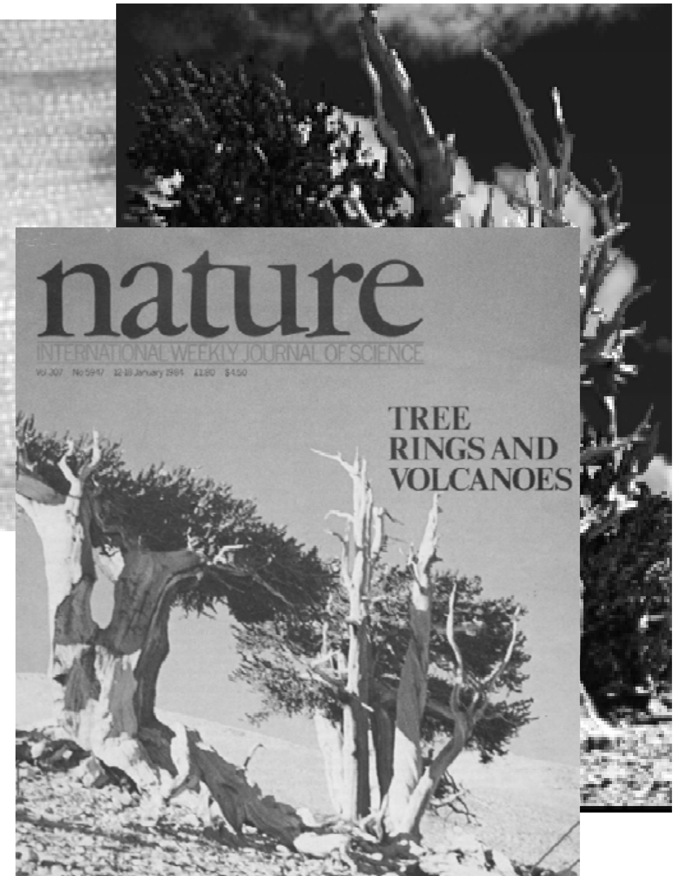
For analyzing & answering questions about possible causes for variations in the BCP ring widths – you'll need to know the following:

- Possible causes for FROST RINGS in BCP
- What the graph of global Northern Hemisphere temperature variations looks like
- What else might enhance growth in trees

WHAT YOU NEED TO KNOW ABOUT FROST RINGS:





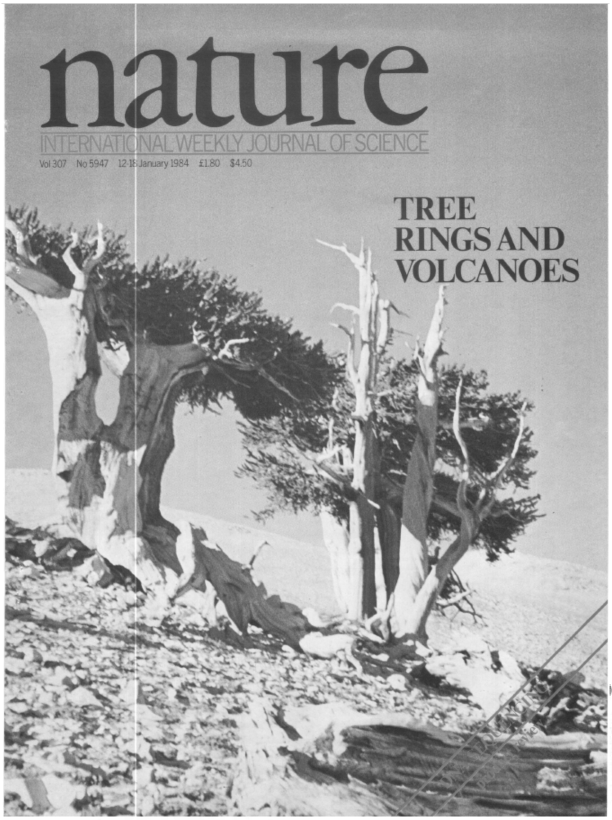


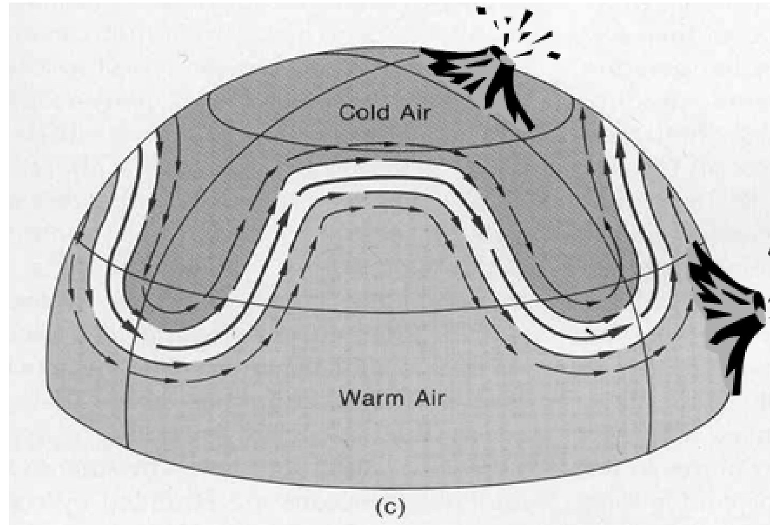
Produced by a severe freeze occurring DURING the tree's growing season :

2 nights $< -5^{o}$ C
intervening day 0^{o} C

Growing season for <u>high</u> elevation bristlecone pines = June – Aug, continues into September during cooler years (growth is slower during cool summers) and makes them more susceptible to an early frost

Have been linked to global cooling after major volcanic eruptions !!





(c)

rinted from Nature, Vol. 307, No. 5946, pp. 121-126, 12 January, 1984

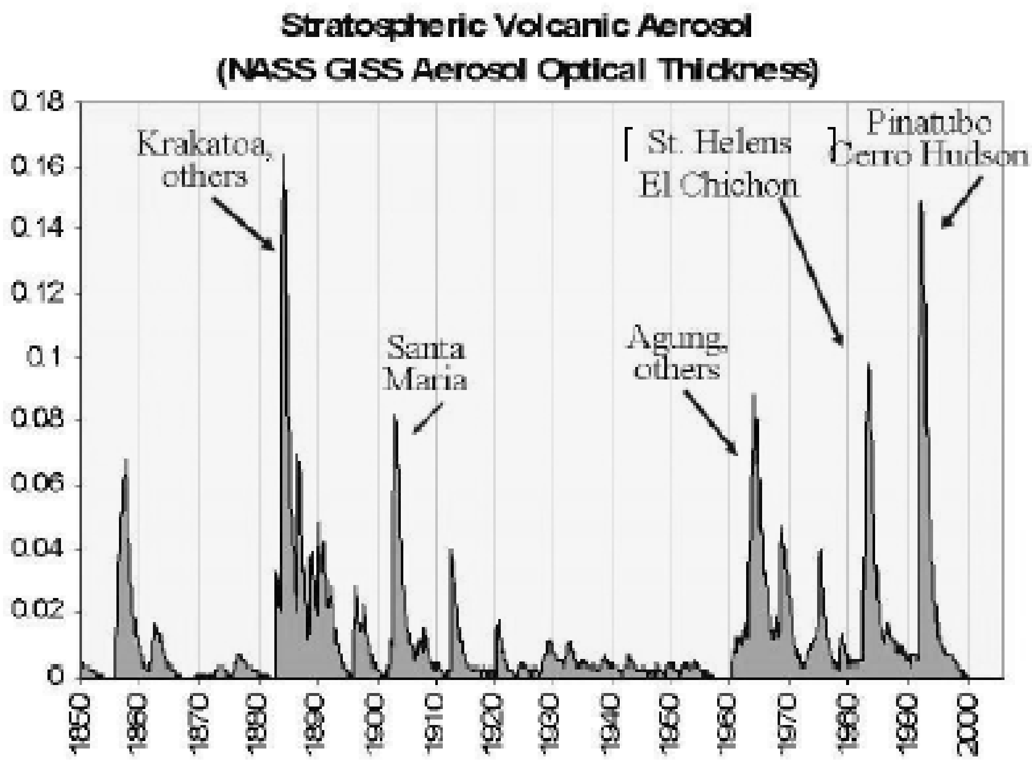
Frost rings in trees as records of major volcanic eruptions

Valmore C. LaMarche Jr* & Katherine K. Hirschboeck†

* Laboratory of Tree-Ring Research and † Department of Geosciences, University of Arizona, Tucson, Arizona 85721, USA

New data about climatically-effective volcanic eruptions during the past several thousand years may be contained in frost-damage zones in the annual rings of trees. There is good agreement in the timing of frost events and recent eruptions, and the damage can be plausibly linked to climatic effects of stratospheric aerosol veils on hemispheric and global scales. The cataclysmic proto-historic eruption of Santorini (Thera), in the Aegean, is tentatively dated to 1628–26 BC *from frost-ring evidence.*

Volcanic aerosols in stratosphere from sulfur dioxide gases in eruption can REFLECT back incoming solar radiation → global cooling



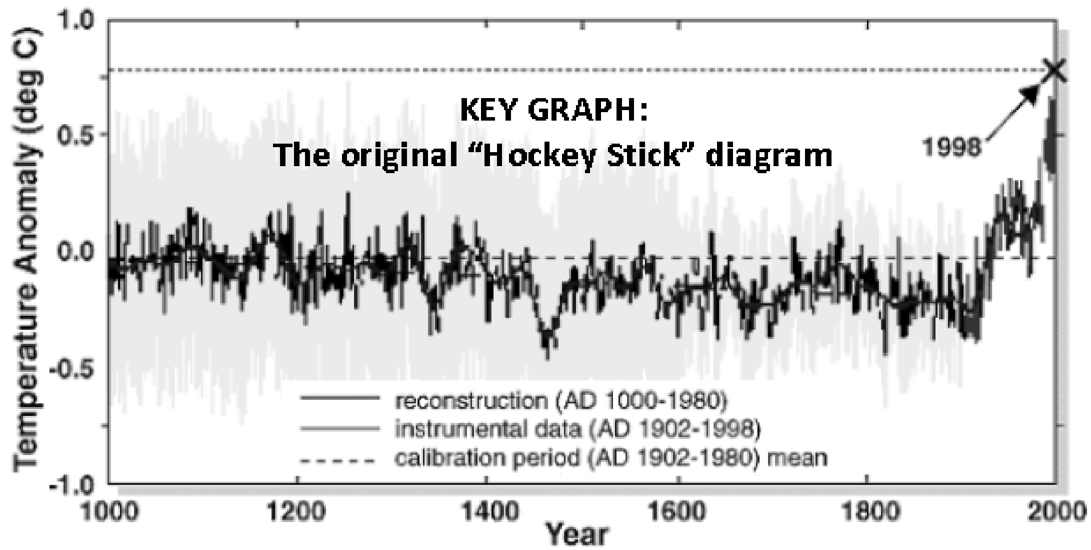
Volcanic aerosols in the high atmosphere block solar radiation and increase cloud cover leading to widespread cooling, especially significant in summer

SOME MAJOR VOLCANIC ERUPTIONS OF THE PAST 250 YEARS:

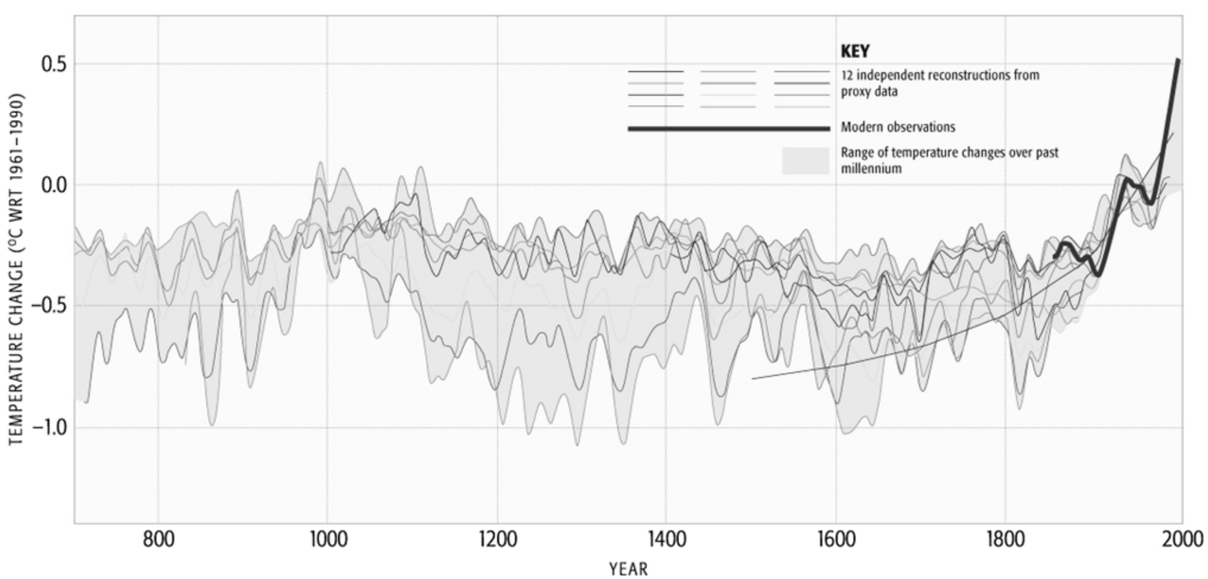
Laki (Iceland)	1783
El Chichon? (Mexico)	1809
Tambora (Indonesia)	1815
Cosiguina (Nicaragua)	1835
Krakatau (Indonesia)	1883
Agung (Indonesia)	1963
El Chichon (Mexico)	1982
Mt Pinatubo (Philippines)	1991

Global cooling can occur for up to 3 years after the eruption!

PAST NORTHERN HEMISPHERE TEMPERATURE VARIATIONS



NORTHERN HEMISPHERE TEMPERATURE CHANGES OVER THE PAST MILLENNIUM



P 86 in CLASS NOTES

THE ROLE OF CO_2 & TREE GROWTH!

LARGE FLUX OUT:

Photosynthesis:	CO_2	$+$	H_2O	$\longrightarrow$	CH_2O	$+$	O_2.
(Primary Production)	carbon dioxide		water		carbohydrate		oxygen gas