→ Each member of the group sign below in his or her own handwriting AND a different student should fill in the answer for each blank on this assignment. (These questions are also on pp 73-74 in Class Notes)

1. Based on what you learned in class and on the information in CLASS NOTES pp 71-74, list at least 4 reasons why the eruption of Tambora in 1815 resulted in the largest GLOBAL cooling effect of all the eruptions listed in Table 1.

Eruption	Year	Amount of	Stratospheric		H <sub>2</sub> SO <sub>4</sub>	Estimated N.H.
& Latitude		Magma	Aerosol (Mt)		estimate	Temp change
		Erupted (km <sup>2</sup> )	S.H.	N.H.	(Mt)	(°C)
Tambora (8°S)	1815	50	150	150	52	-0.4 to -0.7
Krakatau (6°S)	1883	10	~34	55	2.9	-0.3
Santa Maria (15°N)	1902	9	22	<20	0.6	-0.4
Katmai (86°N)	1912	15	0	<30	12	-0.2
Agung (8°S)	1963	0.6	30	20	2.8	-0.3
Mt St. Helens (46°N)	1980	0.3	0	no info	0.08	0 to -0.1
El Chichón (17°N)	1982	~ 0.3	<8	12	0.07	-0.2
Pinatubo (15°N)	1991	~ 5	no info	~25	~0.3	-0.5
		(Large eruption if lots of magma)	(How much got into each hemisphere)		(Sulfur-rich if high)	
#1						
#2						
#2						

## **TABLE 1 COMPARISON TABLE OF ERUPTIONS** (also on p 73 of class notes)

#4\_\_\_\_\_

#3\_\_\_\_\_

2. Give at least two reasons why the eruption of Mt. St. Helens was not a very climatically effective eruption:

#2\_\_\_\_\_

3. The figure at right shows the global temperature response after the eruptions of **Agung in 1963, El Chichón in 1982, and Pinatubo in 1991** at different levels in the atmosphere from the surface up to the lower stratosphere. (*Since El Chichón's climatic effect was influenced strongly by El Niño, we'll focus on the other two eruptions.*)

3a. **Which levels** (A = Surface, B = Lower Troposphere, C = Lower Stratosphere) show a **COOLING response** immediately after the eruptions of Agung and Pinatubo? *(circle all that apply):* 

A-Surface B-Lower Troposphere C-Lower Stratosphere

3b. Which levels show a WARMING response immediately after the eruptions of Agung and Pinatubo? (*circle all that apply*):

A-Surface B-Lower Troposphere C-Lower Stratosphere

4. **Describe HOW** the temperature at the four different levels in the atmosphere responded to the effects of Agung's and Pinatubo's sulfate aerosol veils and **explain WHY** by referring to specific processes of the **Radiation Balance:** 

A-Surface \_\_\_\_\_

B-Lower Troposphere\_\_\_\_\_

C- Lower Stratosphere\_\_\_\_\_

5. At right is the graph showing annual incoming SW solar radiation absorbed in the **troposphere's** earth-atmosphere system and outgoing LW terrestrial radiation **leaving the tropospheric** earth-atmosphere system at various latitudes.

A = solid curve = incoming shortwave (solar) B = dashed curve = outgoing longwave (terrestrial)

**SKETCH** A NEW **CURVE A** OR NEW **CURVE B** to show how the energy balance would change if **a major volcanic eruption** (like Krakatau or Tambora) occurred . Assume that the **eruption produces a long-lived aerosol veil in the stratosphere** over both hemispheres and that this veil reflects large amounts of incoming solar radiation back to space *before* it enters the troposphere's earth-atmosphere system shown in the graph.

[Hint: you do not need to worry about stratospheric warming for this question.]



