# THE ANSWERS to G-4!



**#1. List 4 reasons why Tambora in 1815 resulted in the largest GLOBAL cooling:** 

- #1 Low latitude eruption → both hemispheres
- #2 Large amount of eruptive material (50 sq km!)
- #3 Aerosol cloud was HUGE and went into both hemispheres equally
- #4 Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) content was very large

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

#1 High latitude – could only affect part of Northern Hemisphere

#2 Low sulfur content (also, low volume, didn't get to S. Hemisphere, etc.) # 3 HOW did the temperature at the 4 levels respond to the Agung and Pinatubo eruptions?

#4 EXPLAIN WHY – referring to Radiation Balance?

# Level A (Surface) - Cooled

Why? Solution by sulfate aerosols in stratosphere and therefore less SW got into troposphere to be absorbed by Earth's surface

### Level B (Lower Troposphere) – Cooled

Why? Systratospheric aerosols => less SW absorbed at surface <u>and</u> in troposphere, ALSO: less radiated up into troposphere from the cooler Earth's surface <u>Level C (Lower Stratosphere)</u> – Warmed immediately after both eruptions

Why? Sulfate aerosols in the stratosphere <u>absorbed</u> some wavelengths of incoming SW and heated up, they also absorbed some of the Earth's outgoing LW as it radiated up out of the troposphere

# TO SUMMARIZE: 2 KEY POINTS

• Major eruptions with a long-lived sulfate aerosol veil <u>REFLECT</u> incoming solar radiation back to space <u>BEFORE</u> it enters the mid- & lower troposphere or gets to the Earth's surface, hence the troposphere & surface get COOLER after an eruption.

 The aerosols in the stratosphere can also <u>ABSORB</u> some wavelengths of incoming SW and outgoing LW, so that the stratosphere WARMS slightly after an eruption.

# Show how the energy balance would change if a major volcanic eruption occurred:



#### WHICH ONE IS RIGHT? Does the change affect CURVE A or CURVE B?

## A moves down, and B stays the same . . .



... but eventually B will also move down a bit due to cooler Earth temps and less outgoing LW