HIPPO Curtain Plot Assignment:  
Teacher Edition

## Limitations of the HIPPO data:

* The flights are limited to the Pacific Basin
* Due to the varying depths in the troposphere the HIPPO team was not able to sample the whole troposphere. In the tropics, the tropopause reaches altitudes greater than 50,000’, which is the maximum altitude for NSF/NCAR GV HIPPO research flights.

## Carbon Dioxide Concentrations in the Atmosphere

* A source is any process or activity through which a greenhouse gas is released into the atmosphere. Both natural processes and human activities release greenhouse gases.
* A sink is a reservoir that takes up a chemical element or compound from another part of its natural cycle.

*Here are some general answers:*

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| Variables | Description of the effect | Atmospheric CO2 concentration will increase or decrease |
| Ocean waters | Water is a carbon sink. Much of the carbon emitted is absorbed into ocean water. | Decrease |
| Plants | Plants use carbon dioxide in photosynthesis and are also considered carbon sinks. | Decrease |
| Fossil fuel combustion/  industrial use | Burning of fossil fuel (source) releases carbon which was stored in the fuel product into the atmosphere | Increase |
| Seasons | Oceans and plants store carbon at different rates in the warmer and cooler periods. During spring and summer blooming plant contribute to a decline in CO2 in the atmosphere due to increasing photosynthesis. Additionally the ocean waters store carbon which is released back into the atmosphere in warmer water and increase CO2 in the atmosphere.  *\*day vs. night can have an effect on photosynthesis rates too.* | Warmer weather for plants decreases CO2  Colder water decreases CO2 |
| Latitude | CO2 concentrations are greatest at equator and least a poles (typically)  Different amounts of land and ocean at each latitude(varying amounts of sources and sinks)  Global wind patterns can also influence the concentrations | Varies |
| Altitude | CO2 decreases with increasing altitude due to gravity.  There are two CO2 sources in the stratosphere; one is carbon monoxide (CO) and the other is methane (CH4). CO is rapidly oxidized to CO2 in the lower stratosphere. | Varies |

## Carbon Flow Map

The map may include the following, not limited to:

* Large arrows pointing into the ocean - sink
* Slightly smaller arrows point towards land - sink
* Large arrows point towards the atmosphere from highly industrialized countries, emitting large amounts of fossil fuels - source
* Northern Hemisphere emits more CO2 than the Southern Hemisphere due to more burning of fossil fuels - source.
* Depending on the season the students select, arrows will be vary over land and ocean as well as hemisphere
* Larger arrows near equator and mid-latitudes, more photosynthesis occurs in those regions than in Polar regions – Equatorial & mid-latitude sources

## Assessment Question

May include the following, not limited to:

* Atmospheric CO2 levels would increase in the regions above the fire, but local communities should not be alarmed.
* The South East Trade winds would push the CO2 in the 0-30 degrees latitude towards the Pacific Ocean and up into the uppermost atmosphere where the CO2 concentrations will increase.
* The CO2 levels will be elevated as compared to normal over the ocean, however, the ocean will act as a sink and will reduces levels in the southern hemisphere.
* The Northern latitudes may experience slight elevated CO2 levels due to global winds.
* The Polar Regions should still have the lowest levels of atmospheric CO2.