HIPPO Curtain Plots Activity:   
Atmospheric CO2 Variation

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| Standards | (9-12th grade) Earth Systems Science:   * Climate is the result of energy transfer among interactions of the atmosphere, hydrosphere, geosphere, cryosphere and biosphere * The interaction of Earth's surface with water, ice, air, gravity, and biological activity causes physical and chemical changes |
| Objective | Students will analyze scientific data and predict patterns of gas movement in various situations, as a scientist. |
| Materials | Internet, HIPPO curtain plots, variables/explanations |
| Lesson  3 x (45 minute class) | Inquiry: 5 E’s Lesson   * (5-10 minutes) Engage:   + Ask the questions: What gases are in the atmosphere? How do we know they are there?   + (1 minute) Watch the below clip on the HIPPO project (Steve Wofsy) to introduce a method scientists are trying to measure atmospheric gases. <http://www.youtube.com/watch?v=WEJ_ko0hJ0M&feature=relmfu> * (20-35 minutes) Explore   + (5-10minutes) Partner students and give each pair the January 2009 CO2 graphs from HIPPO I and the November 2009 CO2 graphs from HIPPO II. Have students identify the variables, interesting points on the graphs, and put meaning to the data.     - All markings are directly on the graph with highlighter.   + (5minutes) Watch this clip to see a scientist (Steve Wofsy) interpret a curtain plot. <http://www.youtube.com/watch?v=crO_oL3ZlOE&feature=related>   + (5-10 minutes) Discuss limitations of this type of research with students.   + (5-10minutes) Re-visit the graphs as a class and students can share what the graph is showing. |
| * ( 45 minutes) Explain   + (5 minutes) Have students define “source” and a “sink” in relation to carbon.   + Students will need the Carbon Dioxide Concentrations worksheet and a computer/internet. They need to conduct research on the internet regarding factors which change atmospheric carbon dioxide. |
| * (20minutes) Elaborate:   + Carbon flow Map of sinks and sources worksheet.      * (10-20 minutes) Evaluate:   + **Short Response Question:** As an expert scientist, you were selected to fly on the next HIPPO mission. Unfortunately, a forest fire over Brazil will keep you grounded. Meanwhile, your supervisor asks you to speak to the public about the implications of this fire on atmospheric CO2. Use all of the knowledge to create a statement to the public about the impact of this forest fire on the atmospheric CO2 levels in Pacific Ocean (describe the concentration of atmospheric CO2 from pole-to-pole). |
| Extensions | * Heat trapping gases (greenhouse gases) concentrations over different regions. HIPPO curtain plots of other chemical species * Keeling curve <http://www.planetforlife.com/co2history/index.html> * Seasons <http://www.esrl.noaa.gov/gsd/outreach/education/poet/CO2-Seasons.pdf> |
|  | * NOAA- CO2 measurements <http://www.esrl.noaa.gov/gmd/ccgg/trends/> * Carbon Sources/Sinks:   + Natural Environmental Research Council   + EPA   + Environmental Literacy Council   + Environmental Research council * HIPPO Website: <http://hippo.ucar.edu/> * HIPPO on Facebook: <http://www.facebook.com/HIPPONCAR> * HIPPO on YouTube: <http://www.youtube.com/HIPPONCAR> * HIPPO on Twitter: <http://twitter.com/NCAR_HIPPO> * HIPPO I Flight Path: [http://www.eol.ucar.edu/deployment/field-deployments/field-projects/hippo\_global\_1/hippo1/?searchterm=hippo%20i](http://mail/exchweb/bin/redir.asp?URL=http://www.eol.ucar.edu/deployment/field-deployments/field-projects/hippo_global_1/hippo1/?searchterm=hippo%2520i" \t "_blank) * HIPPO II Flight Path: [http://www.youtube.com/user/HIPPONCAR#p/u/43/H9PDUNPVZpw](http://mail/exchweb/bin/redir.asp?URL=http://www.youtube.com/user/HIPPONCAR%23p/u/43/H9PDUNPVZpw" \t "_blank) * HIPPO III Flight Path: [http://www.youtube.com/user/HIPPONCAR#p/u/26/Ji9OsTDjwdQ](http://mail/exchweb/bin/redir.asp?URL=http://www.youtube.com/user/HIPPONCAR%23p/u/26/Ji9OsTDjwdQ" \t "_blank) * HIPPO IV Flight Path: [http://www.youtube.com/user/HIPPONCAR - p/u/13/hP5tCE7fueo](http://www.youtube.com/user/HIPPONCAR#p/u/13/hP5tCE7fueo) * HIPPO V Flight Path: [http://www.youtube.com/HIPPONCAR - p/u/11/NoHnY6a2dbs](http://www.youtube.com/HIPPONCAR#p/u/11/NoHnY6a2dbs) |