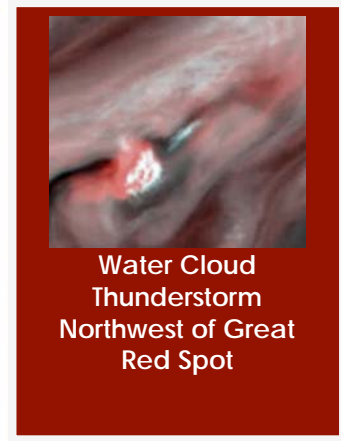


Conduct Your Own Convection Investigations



As shared in the “Zap! Cloud to Cloud Lightning” news article, Jupiter storms are caused through the process of convection which is the transfer of heat by the movement of a heated material. For Jupiter, heat is transferred by the movement of heated gases from the lower atmosphere outward.

During the New Horizons mission scientists were able to observe ammonia clouds welling up from the lower atmosphere and similar fresh water ice clouds were observed by Galileo. These occur at the lightning locations.

Overview: In this activity, participants are invited to observe the process of convection.

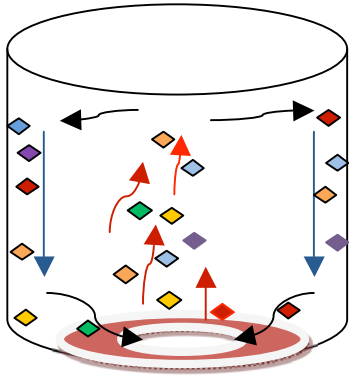
Safety First: **Only adult leaders should set up and guide participants through this investigation. Participants should safely observe what is happening without touching any part of the experiment.**

Materials: (per team)

- small hot plate
- pyrex glass dish or beaker larger than the hot plate filled 1/2 way with water or cooking oil
- Dropper filled with food coloring or small amount of glitter
- Convection Observation Data Sheet
- pencil

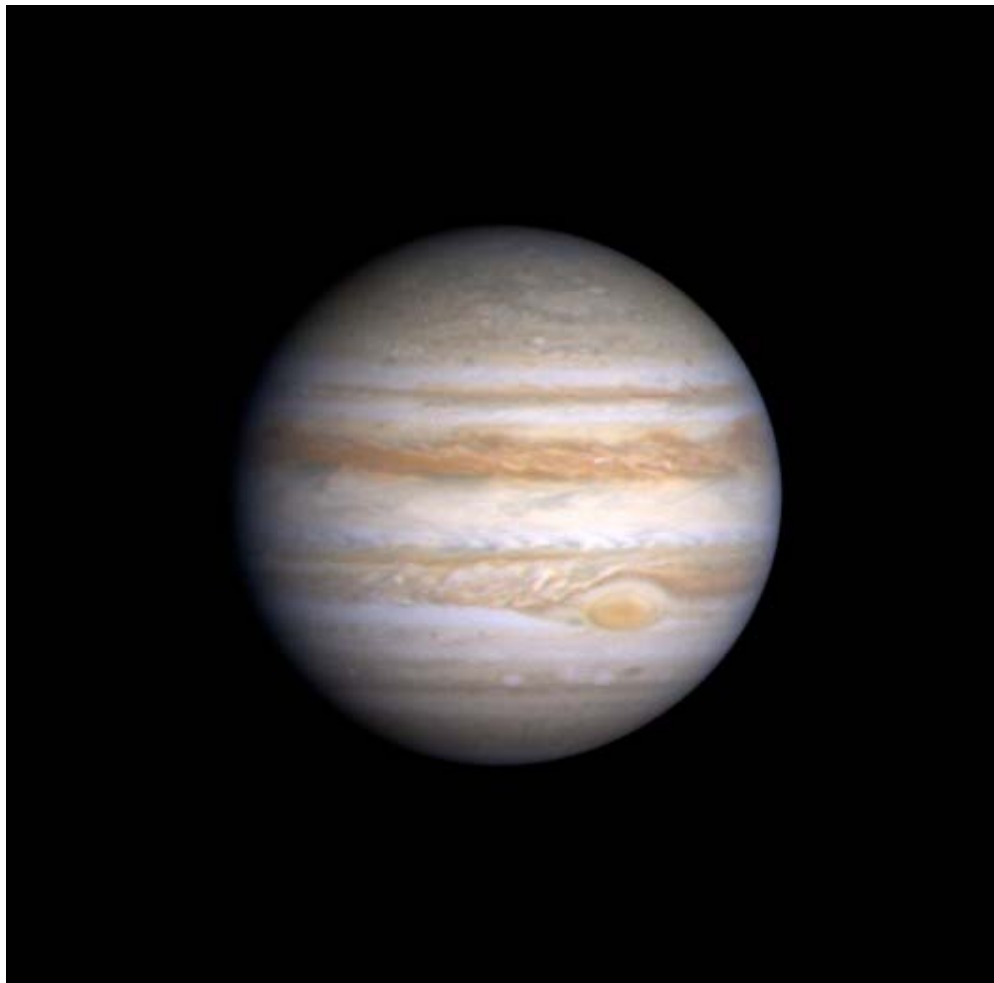
Procedure:

1. Fill a pyrex glass dish or 500 ml beaker 1/2 full with water.
2. Place a few drops of food coloring or glitter in the bottom center of the dish.
3. Invite participants to make an observation.
4. Place the container on the hot plate and invite participants to observe, describe and draw what they see. The sides of the dish must be larger than the hot plate or it will heat evenly. The idea is to have only the center of the container over the hot plate.
5. Invite participants to draw and describe what they see. (The food coloring or glitter closest to the main heat source rises and then once at the top sinks back down at the side. Inform observers that they are observing a convection current.)
6. Question the participants as to what started the current in motion? (heat)
7. Explain to participants the motion of the observed convection current:
 - The center area directly above the hot plate is becoming heated and therefore less dense than the surrounding area, so it begins to rise towards the surface.
 - Cooler water at the top sinks down the sides to replace the warmed water rising.
 - Once at the surface, the heated water begins to cool and sinks down the sides where it becomes heated again.



Motion of Glitter Convection Current

8. Relate the observation to convection currents on Jupiter.
Hydrogen gas is constantly being compressed deep in Jupiter, generating more heat from the interior than is absorbed from the Sun. As this heat is conducted and radiated outward, heated air parcels being less dense than the area around them rise higher into the upper atmosphere. When the gases in the air freeze out the friction of rubbing ice particles charges the clouds. Lightning is a way the charges become balanced.

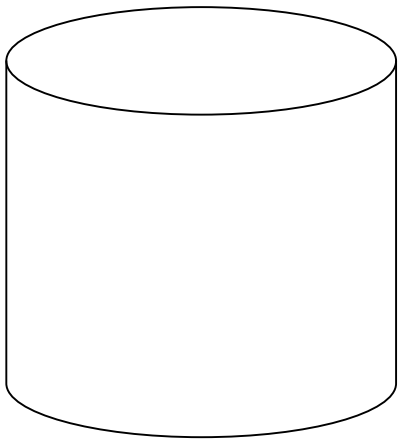


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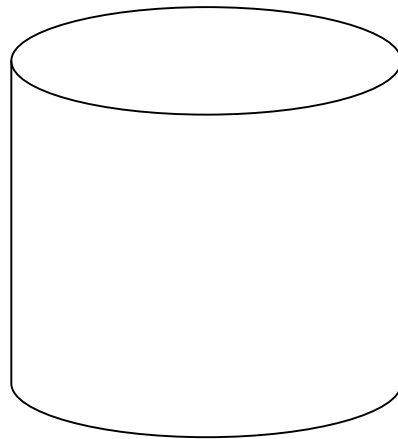
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Convection Observation Data Sheet

Directions: Draw what you observe happening in the container before and during the investigation.



Initial Observation



Heat Added

1. What happened when heat was added to the dish?

I observed _____

2. Please draw arrows onto the "Heat Added" beaker to indicate the movement observed.



A Second Convection Exploration Activity from NASA

Whirly-gig

Tom Benson & Kathy Zona, NASA Glenn Research Center

Material List:

1. tagboard
2. jar
3. needle
4. aluminum foil
5. cellophane tape
6. pipe cleaner

Procedure:

Cut out the propeller from the tagboard and cover it with aluminum foil. Make a cylinder from the remaining tagboard to wrap around the jar. Suspend the propeller above the cylinder using the needle and the pipe cleaner so it spins freely. Place the cylinder over the jar of warm water.

Scientific Principle:

The warm water will create an air stream that flows out from the cylinder. This demonstrates that warm air molecules are less dense than the cold air around the cylinder making the propeller turn freely. The propeller will continue to spin until the water has cooled.

