

**The Education Program at the  
New Jersey Sea Grant Consortium**

22 Magruder Road, Fort Hancock, NJ 07732 (732) 872-1300

[www.njseagrants.org](http://www.njseagrants.org)



# UNDERSTANDING STORM SURGE

## ACTIVITY #2 - WINDY BALLOON

### OVERVIEW

Winds are created by a change in air pressure. During this activity, students will do a simple experiment to observe how air strives toward a state of equilibrium and travels from high pressure to low pressure to obtain equilibrium. Within the atmosphere, there are several forces that impact the speed and direction of winds, but the most important is Earth's gravitational force. As gravity compresses Earth's atmosphere, it creates air pressure, which is the driving force of wind. Without gravity, there would be no atmosphere or air pressure, and thus, no wind.

### MATERIALS

Balloons- 1 for each pair of students

### PROCEDURE

1. Pair up students and give each team a balloon. Ask each pair of students to blow up the balloon but not to tie it closed. They must hold the balloon closed between their fingers and answer questions 1 and 2.
2. Ask students to hold onto the balloon but release some of the air and answer questions 3, 4, 5.



The New Jersey Sea Grant Consortium (NJS GC) is an affiliation of colleges, universities and other groups dedicated to advancing knowledge and stewardship of New Jersey's marine and coastal environment. NJS GC meets its mission through its innovative research, education and outreach programs. For more information about NJS GC, visit [njseagrants.org](http://njseagrants.org).

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### Student Questions:

1. Hypothesize what will happen to the balloon when you very carefully hold it closed and let just a bit of air out. Will air be able to move into the balloon or will air move out?
2. Do you think the air inside the balloon is at a higher or lower pressure than the air outside of the balloon?
3. Carefully, relax your fingers so the balloon opens for just a second but don't let go. After a second, hold it closed tightly again. Use a weather term to describe what you felt coming out of the balloon when you relaxed your fingers for just a second.
4. Release the balloon. Describe what happened. In which direction did the air flow?
5. Based on this experiment does wind flow from low to high pressure or high to low pressure?



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#### Student Answers:

1. Open ended, but air will flow out of the balloon and the balloon will deflate. The air in the balloon will flow from a high pressure system to a lower pressure system in an attempt to create equal pressure inside and outside the balloon.
2. The balloon is filled with air that is compacted into a small space. By inflating the balloon, students have created a high pressure system. Air pressure will be lower outside of the balloon.
3. Wind!
4. The pressure in the balloon was much higher than the pressure outside the balloon. When released, the air inside the balloon created wind, which propelled the balloon for a bit until it released all its air. Once the balloon was empty, gravity forced the balloon down to the ground. The air flowed in the opposite direction of the balloon.
5. Air moves from high to low pressure.

#### Further Explanation:

Air moves because of an imbalance in the forces acting upon the air molecules. High pressure air molecules spread apart and move very fast; low pressure air molecules move more slowly and compact together. However, the Earth would like to have these air molecules all moving at the same rate and spread equally across its atmosphere, so Earth is constantly trying to create this balance. In this experiment, a high pressure system is created by forcing air into a compact enclosed area (the balloon). This produces an area of high pressure inside the balloon while the pressure is much lower outside the balloon. When the balloon is opened and released, the two areas of different pressures meet and create wind as the air strives to create an equal balance of pressure between the area in and outside the balloon. Wind is the atmosphere's way of trying to bring the interaction of these forces into a balance or equilibrium. There is always a wind blowing somewhere across the Earth due to the uneven heating of the Earth by the sun and the Earth's rotation. Both factors cause constant change in air pressure.



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