

B4 ACTIVITY 3: LAND AND SEA BREEZES

Background

The aim of this activity is to examine the **causes of land and sea breezes**.

Heat energy flows from a region of high temperature to a region of low temperature. If there is a significant enough **temperature difference** or **gradient** we can feel a breeze or a draught. This is warmer air moving towards the colder air. In this activity, the air over the ice is at a significantly lower temperature than the air over the heated sand, so the hot air will move towards the cool air region. In order to see the air moving, a lighted taper is put out, creating smoke. The smoke will move in the direction of the air, or breeze.

For practical reasons, this activity might be best demonstrated by the teacher.

Equipment required (per group):

- Two shallow metal pans (i.e. baking trays)
- Sufficient ice to cover the base of one of the pans
- Sufficient sand to cover the base of one of the pans
- Matches
- Taper (a piece of thin paper will do)
- Oven gloves
- Heatproof mat
- Access to an oven

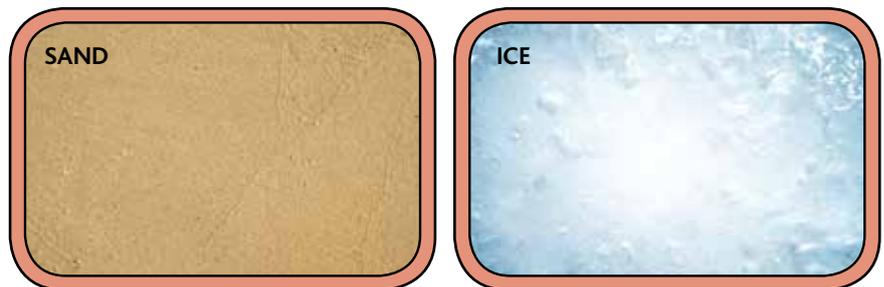


Figure 19: The sand represents land. The ice represents the sea

What to do:

1. Set up the investigation in an area protected from draughts.
2. Set the oven to about 200°C.
3. Pour some sand into one of the pans and put it in the oven to heat for about five to eight minutes.
4. While the sand is heating up, light a candle, or paper taper, and then blow it out.
 - ❓ *Which direction does the smoke flow in?
(If there is no draught the smoke will flow straight up like a convection current.)*
5. Fill the second pan full of ice.
6. Using oven gloves, carefully remove the tray of sand from the oven and put it on a heatproof mat beside the pan of ice.
7. Light the candle or paper taper again and blow it out.
8. Hold the smoking taper in between the two pans, right above the edge of the ice pan.
 - ❓ *What direction does the smoke now flow in?
(Because there is a temperature difference where the ice and sand meet, a breeze develops and the smoke floats sideways.)*

B4.3 Discussion points: Breezes

1. What is meant by the phrases 'offshore breezes/winds' and 'onshore breezes/winds'?
 2. How might these breezes affect the waves?
 3. Why are surfers particularly interested in these winds?
 4. What time of year might the offshore winds be high? Why?
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Resources:

Vernier.com has another version of this activity using sensors. The illustration in Figure 20 is from that site where you can also [view the full experiment](#).

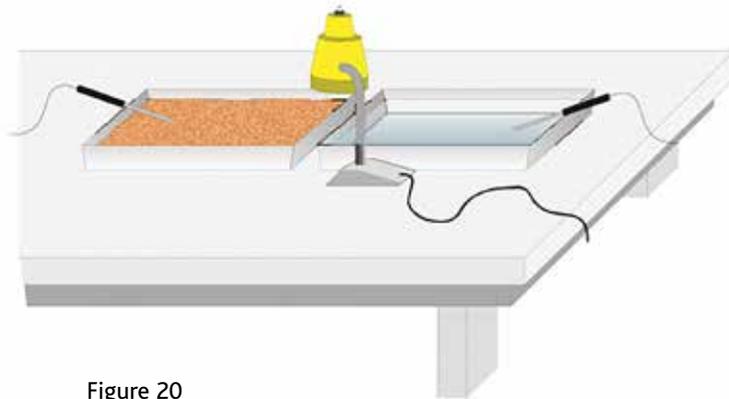


Figure 20