

Activity 3 – The Earth, a Radiating Planet



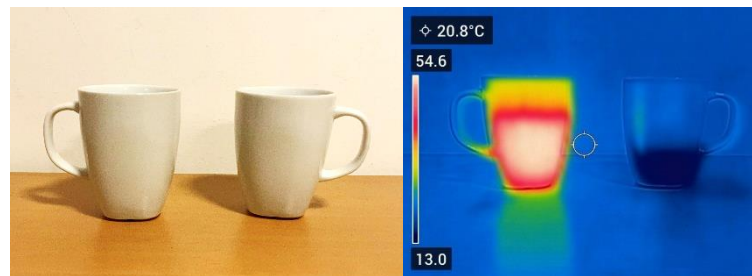
Part 1: Can we make the heat radiation of the Earth visible?

- Observe people with and without glasses with the thermal imaging camera. What can you observe? Which parts of the face are warmer, which colder?

Places like the cheeks or lips, which are well supplied with blood, can be seen intensively on the thermal imaging camera. The eye areas that are covered by the glasses are completely dark. Without glasses, these areas are reddish, which suggests that the glasses' lenses "swallow" the thermal radiation.

- Heat radiation can also be felt! Feel carefully next to a cup of warm tea or another hot body; also observe with a thermal camera.

The areas that appear red or yellowish feel warm. The more intense the color on the thermal imaging camera, the warmer or hotter.



*Tasse mit heißer und kalter Flüssigkeit
Mit dem bloßen Auge (links) und unter der Wärmebildkamera (rechts)*

→ Rub your palms firmly together for five seconds and then press them on the table for five seconds. After removing your hands from the table, look at the contact surface with the thermal imaging camera. Explain how the image is created and why it disappears again. Rub the floor with your feet. What do you see?

The handprint is still clearly visible with the thermal imaging camera for a few seconds after the hands have been removed again. After a short time, however, the intensity and color of the imprint fades under the thermal imaging camera.

The rubbing of the hands caused the hands to become warm. The hands then heated the part of the table on which they were pressed. However, the table releases the heat back into the environment, it cools down.

? Make a connection between the fading of your handprint and the radiant surface of the Earth.

Why doesn't the Earth cool down more and more?

The table cools down and the handprint fades because no further heat is added. However, our earth is constantly irradiated by the sun, it is in radiation equilibrium. Thus, theoretically, it has also reached an equilibrium temperature that does not drop any further. Due to the greenhouse effect, the temperature of the earth's surface even increases.

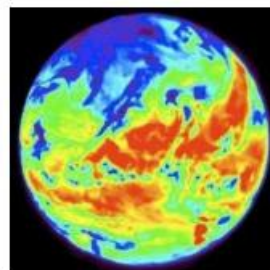
? Look at the following pictures a) of the Earth and b) of the Sun. Can you see what is shown in picture c)?



a) Erde



b) Sonne



c) ?

The Earth and Sun with a normal camera (left and center) and the Earth with a thermal imaging camera (right).

Part 2: Which materials are transparent to visible light, which to infrared radiation?

→ Use your hand as an infrared radiator and your eyes or the thermal imaging camera to examine the permeability of different materials and complete the table:

Material	Permeable for IR radiation	Permeable for visible light
Glass	Yes	No
Black bag	No	Yes
Paper	No	No
Air-filled balloon	No	Yes
Water-filled balloon	No	No
Textbook	No	No
Cling film	Yes	Yes

? The greenhouse gases in the atmosphere allow visible light to pass almost without hindrance. However, they absorb infrared radiation. Which of the above explored materials also exhibits these properties?

Glass has the same properties as greenhouse gases. Light in the visible range simply passes through, but the IR light is "swallowed".