

Problem VI.1 ... canoeing mystery 3 points; průměr 2,60; řešilo 57 studentů

In sunny summer weather, we observe interesting wind behavior on the river during the day. It is cold in the morning at sunrise, and sometimes there is even morning fog. The fog then quickly dissipates, and the air temperature rises. A light wind then blows up the river. In the evening, the situation calms down, and the wind direction turns downstream as the sun lowers toward the horizon. What causes this phenomenon? Explain the ongoing processes in these two cases.

Katarína was floating down the river and observing.

At night, the temperature in the valley drops below the dew point, which creates a fog that dissipates during the morning or early afternoon as the air warms. After sunrise, the valley begins to warm up. The warm air, which has a lower density due to the heating, begins to flow upwards.

In addition, the air in the mountains also warms up, but the air at the same altitude above the valley has much less heating (this air is further from the surface). Thus, the mountain air will also decrease in density and begin to rise, creating a local subatmospheric pressure at the top of the mountain. This negative pressure will then start to suck the heated rising air from the valley towards the mountaintop, creating an upstream wind.

This anabatic wind is called a valley breeze. In the evening, the temperature slowly drops, then the slopes cool down, and with them, the air, causing the currents to cease after a while. The air continues to cool, increasing its density, sinking into the valley, and flowing further downstream.

As it drops into the river valley, the air may get adiabatically warmed up. The amount of heating depends on several factors (e.g., valley temperature or drop height). This heating can then cause air to rise out of the valley and enhance the suction of air from the mountain slope.

This katabatic wind is called a mountain breeze.

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