



π IN THE SKY⁹

How do we measure the possible environmental impact of a dam from space?

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DAM DEDUCTION

Water exiting a hydropower dam is called non-powered or powered outflow. Non-powered outflow exits via a spillway, on top of the dam. Powered outflow, which is used to generate electricity, travels through penstocks, pipes at the bottom of a dam. Powered outflow is usually colder and travels at a higher velocity, so it can disturb sediments, temperatures, and water quality of downstream rivers, especially when it's a high percentage of the total outflow.

The SWOT mission, a satellite designed to survey all of Earth's surface water, including lakes, rivers, oceans, and reservoirs, can help scientists better analyze these impacts.

A dam has 3 penstocks with diameters of 6.2 meters and a measured total outflow of $1,350 \text{ m}^3/\text{s}$. If SWOT measured the reservoir's water depth (H) at 100 m above the penstocks, compute the velocity (m/s) of the powered outflow using $V = \sqrt{2gH}$. What is the powered outflow if one penstock is open? Is this a high or low percentage of the total outflow? What can this tell you about the potential environmental impacts?

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