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[airplane]

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Sproles: We're in the prairie central heartland of Montana of the

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headwaters of the Missouri River, and we're at the Central Agricultural Research

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Center, which is Montana State University's working agricultural research lab

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here in the center part of the state. Part of NASA's SnowEx is

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to better understand what and what we cannot measure from the air

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or from space to try to advance satellite remote sensing

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of snow.

Polamacki: Out here as you can see looking around

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the snow that we're studying out here is

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highly spatially variable.

Sproles: You can have anywhere from, you know, as you can see

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behind me, a lot of snow to no snow over very short distances.

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And so how we can better quantify that from space is important.

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Polamacki: Some really interesting questions that I think we're getting at up here that we

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wouldn't be able to up in the mountains where we are normally working.

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Feduschak: Today I have dug a few snow pits, taken some

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measurements, been wrestling with technology as

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always seems to be the case.

Sproles: We're using a range of techniques. We're going

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from old school techniques, like digging snow pits, where

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we can really get detailed measurements of the snow and the snow properties

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as we go with depth.

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[natural sound]

Sproles: We're doing simple transects where we're

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measuring snow depth going across the whole landscape here

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and then we're using some pretty sophisticated techniques as well.

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We're using UAV's, uncrewed aerial vehicles, or drones.

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Polamacki: When I flying the drone earlier today, I was basically just

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taking many, many photos of the ground from up high

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to get really high resolution measurements with our

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camera of the patchiness of the snow. We can throw

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all of those photos together in a piece of photogrammetry

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software, stitch them together into a three-dimensional model. We can

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basically select any point in this giant field and

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determine what the snow depth was. It's a way

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for us to cover a lot of ground pretty quickly.

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Mullen: Today I'm collecting albedo measurements from a UAV.

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Albedo is essentially how reflective

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the surface is. It tells us both

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how much energy coming from the Sun the surface is reflecting, but more

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importantly with regards to snow, it tells us how much energy that

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snow is absorbing, which allows us to kind of determine

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how fast it's going to melt and allows us to better predict

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runoff quantities for water resource modeling.

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Rizza: We're looking to use the lidar data to map the snow surfaces.

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and ultimately be able to calculate snow volumes and water

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content. Lidar is an active sensing technology

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and so it's a laser that gets shot out of the sensor. It bounces off

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a surface, whether that be the ground or, in this case, the snow surfaces,

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bounces back to the sensor and that measurement is recorded very precisely to give us

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very accurate distance measurement. The biggest challenge

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I'd say is the cold and the wind. The wind is always a challenge

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for us with a drone in particular.

Sproles: It's an extremely

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hard environment to work in, it's harsh, it's windy, things blow around. But that's just

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the nature of where we're working.

Mitchell: Most of the

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agriculture on this landform and in the surrounding area is dry land

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agriculture, meaning they don't use flood or pivot irrigation.

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So we're curious how significant this snow is to

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the soil water, which then turns into crop water.

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Sproles: Prairies and grasslands occupy about ten percent

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of the Earth's land surface, so that's a lot of land, right?

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And of that land surface, about 30 percent of it has seasonal snow, meaning that

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it doesn't snow once a year, but you have accumulation and melt periods throughout.

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Feduschak: As kind of biomes are moving north, these prairies and

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the water that they hold are going to become increasingly important

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for human habitation and food production.

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And so getting an idea of how much snow is on the landscape,

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how that snow is changing, when it's melting, where it's going

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is really important for us to understand, and it's definitely one

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of the big gaps in our understanding of snow