Satellite sandwich technique improves analysis of geographical data

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Combining parallel data from separate satellites can be like trying to make a peanut butter and jelly sandwich.

For the sandwich, you want rich and sweet flavors, blended into a smooth, creamy texture – and you want it all in one convenient package. That's similar to how you want the satellite data, and Bo Yang, a University of Cincinnati graduate student in geography, has a formula for crafting a deeply informative and easily utilized satellite sandwich.

He'll present his research, "Spatiotemporal Cokriging Images Fusion of Multi-Sensor Land Surface Temperature over Thaw Lakes on North Alaska," at the Association of American Geographers annual meeting to be held April 9-13 in Los Angeles. The interdisciplinary forum is attended by more than 7,000 scientists from around the world and features an array of geography-related presentations, workshops and field trips.

For his master's thesis, Yang studied thermal data from two different types of polar-orbiting satellite systems. One system frequently records large images of a region on Earth but in little detail. Another system records small images less frequently but in much greater detail. Analyzing two massive sets of parallel data and finding a way to make them overlap can be complicated and time-consuming. Yang is developing a method to simplify the process.

"In an easy-to-understand way, I am trying to derive both very highdefinition and high-frequency revisiting imagery from two satellite-carried sensors," Yang says. "I use the spatial statistics technique known as co-kriging to fuse multi-sensor land surface temperature images."

Yang uses an algorithm he devised to fill the spatiotemporal gaps between the two data sets. The result is an intricately detailed map covering a large surface area that allows geographers to quickly derive daily – even hourly – surface temperature and emissivity information. These environmental parameters are important to agriculture and water resource management and can be used to detect the onset and severity of drought.

Yang used thaw lakes in the Arctic Coastal Plain of Alaska as his study area. These lakes are a critical component to Arctic ecology and one that is considered vulnerable to the effects of climate warming. Yang's work is connected to a larger project under way in the region, the Circumarctic Lakes Observation Network. The National Science Foundation-funded effort aims to gather long-term, spatially extensive data to evaluate the effect of climate change on the region. UC faculty involved in the project include professors Kenneth Hinkel, Richard Beck, Wendy Eisner, Changjoo Kim, Hongxing Liu and Amy Townsend-Small, all of the McMicken College of Arts & Sciences.

More information: www.aag.org/cs/events/event_detail?eventId=375

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