Regular Press Briefing (220614)

Scientific monitoring of algal bloom utilizing satellites, aircraft, and unmanned air vehicles

Briefed by the Director of Water Environmental Engineering Research Division at the National Institute of Environmental Research, on Tuesday, June 14, 2022, at 10:30 AM.

Hello everyone. I am the Director of the Water Environmental Engineering Research Division at the National Institute of Environmental Research.

I will now begin the briefing on the plan for scientific monitoring of algal bloom utilizing satellites, aircraft, and unmanned air vehicles.'

The National Institute of Environmental Research (NIER), an affiliate of the Ministry of Environment, will preemptively respond to the algal bloom. The NIER plans to remotely monitor the algal bloom through optical sensors placed on satellites, aircraft, and UAVs and share information on the Water Environment Information System starting June 15.

In addition to the aerial hyperspectral images that have been used so far for remote monitoring of algae bloom, multispectral images of Sentinel-2 satellites and hyperspectral images from drones will be added to increase monitoring frequency and range of monitoring areas.

The European Space Agency operates the sentinel-2 satellite, and the satellite visits the same regions every five days while generating multispectral footage with a spatial resolution of 20m.

Last year, the NIER successfully developed a technology that could measure concentrations of chlorophyll-a and phycocyanin in blue-green algae using a wavelength specific to algal bloom feed from the Sentinel-2 satellite. The results were gained as part of the 'Research on using remote monitoring technology to predict changes in a water environment.'

Let me briefly explain the technology. The multispectral satellite video is information that detects energy reflected from the surface at a limited wavelength range of about ten or so.

The method compares data to the observed values analyzed after sampling the river to establish

the correlation formula. Then, inputting the satellite data filmed afterward into this formula converts the numbers into concentrations.

The preexisting method of filming hyperspectral videos with aviation crafts had high spatial resolutions of 2m; however, it came with significant difficulties posed by the weather as a variable factor. We anticipate that by using multispectral videos of satellites, which have relatively fewer restrictions posed by weather, we will be able to conduct more stable monitoring of the algal bloom.

The NIER has newly developed an algorithm for processing UAV footage based on the aeronautical image processing technology. The NIER began to monitor the algal bloom in the areas that require detailed monitoring, such as water intake stations and high tidal areas with UAVs from the middle of June.

For speedy monitoring, all remote monitoring videos will be available within two days after being filmed. As mentioned, other satellite videos are viewable through the Water Environment Information System starting June 15.

Please refer to Attachments for an example of each type of video. It concludes the briefing.

[Q&A]

< Question> I understand that the technology converts wavelengths that measure algal bloom into concentration data, but I am curious about its degree of accuracy. Moreover, the sentinel-2 video is filmed on a 5-day cycle basis. But I assume that it will take a longer time to analyze data. In what ways will it be more effective? You stated that you would preemptively respond to algal bloom. Please let us know what sorts of preemptive effects we can expect from using UAVs compared to directly measuring algal bloom concentrations.

<Answer> First, to answer your question regarding the degree of accuracy, converting a sentinel-2 video into blue-green algae, chlorophyll-a, and phycocyanin videos showed 0.7~0.8 accuracy. In other words, we are maintaining a 70-80% accuracy thus far. In maintaining such a level of accuracy, we are convinced of the effectiveness of this method.

We built our system to take no longer than two days for the process of receiving the satellite

video till its distribution after it has been converted.

We have been operating on that schedule. That's how quickly we can deliver satellite information. A relevant institution with, let's say, a tidal current alarm system would have a sufficient amount of time to use this video to determine when a high concentration of algal bloom will move downstream. Since we can make determinations such as these, we believe this method can be utilized effectively.

< Question> Thank you for your briefing. As far as I know, our country has its own COMS-2A satellite. I would like to know if there are any reasons that the COMS-2A satellite can't be used to monitor algal bloom, such as technical or equipment-related differences. Simply put, I'm curious why we are bringing over a satellite from Europe when our country already has a satellite of its own.

<Answer> First, we use the satellite because to evaluate the spectrum data of algal bloom, we must have data on a specific spectral band; the sentinel-2 satellite supplies that spectral data. Secondly, the sentinel-2 video has a relatively short visitation cycle of only five days. That's another reason we use it.

Another reason has to do with the costs of such a video. The sentinel-2 videos are provided free of charge. Hence, we the sentinel-2 because it's a satellite that satisfies all of these conditions.

< Question> So what you're saying is that the COMS-2A can't be used because its wavelength range isn't in the coverage you need?

<Answer> Yes, that's correct.

<The End>