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Professor Jin-ho Yoon's research team confirmed a phenomenon in which the possibility of high-density fine dust increases due to increased atmospheric stability caused by climate change

☐ GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) School of Earth Sciences and Environmental Engineering Professor Jin-ho Yoon's research team confirmed that over the past 60 years in Northeast Asia, from late winter to spring (February to May), the ground wind speed continued to decrease and that the atmosphere gradually stabilized.

- The results of this research suggest that air quality on the Korean Peninsula may deteriorate through long-term changes in wind speed and static stability in Northeast Asia caused by climate change.

☐ Over the past 60 years, due to global warming, the temperature in the lower atmosphere has increased faster than on the ground, and the atmosphere has steadily stabilized. This condition increases the number of factors that can worsen air pollution such as fine dust in the spring, especially from late winter. When the atmosphere is stable, fine dust transported over long distances from China and fine dust generated in Korea are trapped over the Korean Peninsula and increases the fine dust, which can be confirmed in recent high concentration cases.

* atmospheric stability: In the atmosphere, hot air rises up and cold air comes down. When the air in the lower layer is colder than the top, it is in a stable state in which no movement between top and bottom occurs. In addition, the spread in the horizontal direction is

changed by fluctuations in topographic characteristics and wind direction and turbulence. Therefore, the degree of mixing of the atmosphere can be expressed in terms of the rate of temperature change by altitude and the intensity of turbulence due to the fluctuation of wind direction, and this classification by grade is called "atmospheric stability."

◦ The research team used long-term observational data for 60 years since 1958 and the 'Coupled Model Intercomparison Project Phase 5, CMIP5*' global climate model. As a result of the observational data and model, the researchers confirmed that atmospheric stability has become stronger in recent years than in the past, which is the effect of global warming.

* CMIP5: The most recently developed general circulation model, under which warming continues faster at other low latitudes, even with adequate carbon reduction.

◦ In addition, the increase in static stability is occurring over a wide area of Northeast Asia including the Korean Peninsula, China and Japan, and the effect of global warming on atmospheric stability varies slightly from region to region, but it still increasing.

□ Professor Jin-ho Yoon said, "The research results suggest that the occurrence of high-density fine dust may increase with more atmospheric stability. In particular, despite the government's continuous efforts to reduce air pollution, cases of high concentrations of fine dust are still being reported on the Korean Peninsula. Under these conditions, the atmosphere gradually stagnates in the long run."

□ This research was led by GIST School of Earth Sciences and Environmental Engineering Professor Jin-ho Yoon and conducted by GIST School of Earth Sciences and Environmental Engineering Ph.D. student Dasom Lee, Utah State University Department of Plants, Soils, and Climate Ph.D. student S.-Y. (Simon) Wang, Lin Zhao of the Key Laboratory of Land Surface Process and Climate Change in Cold and Arid Regions at the Northwest Institute of Eco-Environment and Resources in Lanzhou, China, Hyun Cheol Kim of the Air Resources Laboratory at the National Oceanic and Atmospheric Administration in College Park, Maryland, and Kwanchul Kim of the Advanced Institute of Convergence Technology ay Seoul National University and was supported by the National Research Foundation of Korea, the National Strategic Project-Fine Particle of the National Research Foundation of Korea of the Ministry of Science and ICT, the Ministry of Environment, the Ministry of Health and Welfare, and by the U.S. Department of Energy and was published on July 23, 2020, in *Atmospheric Environment*, an internationally renowned journal of atmospheric science, with the print edition available on November 15, 2020.

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