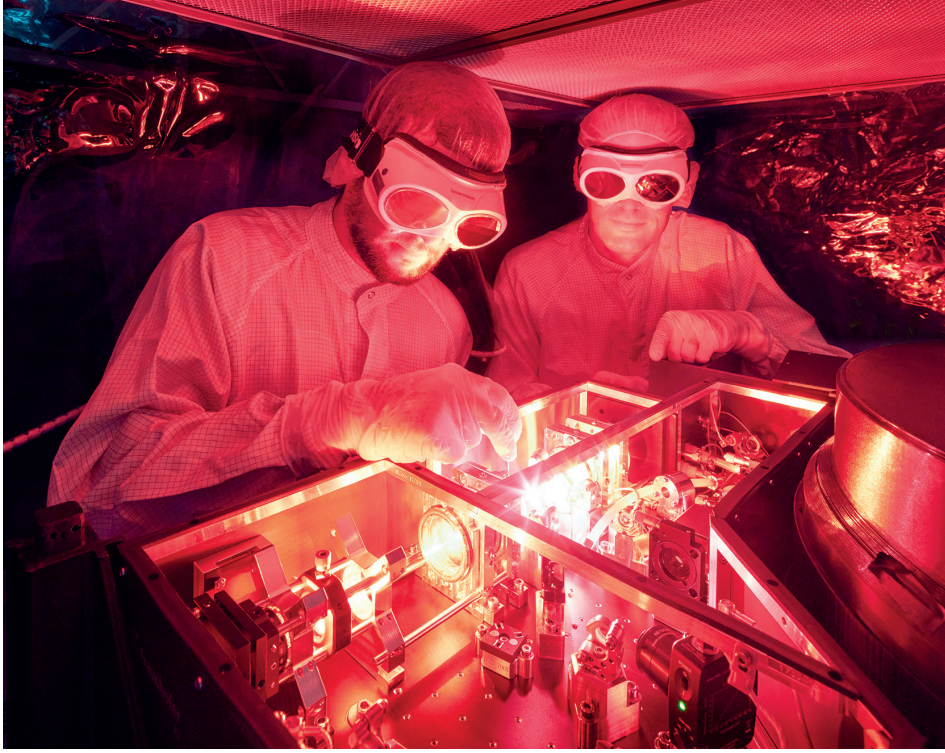

1 LIDAR system with five fields of view during (atmospheric) measurement.
2 Integration of diode-pumped alexandrite laser.

Diode-pumped alexandrite laser for atmospheric LIDAR array

It has become dramatically important to better understand and monitor the atmosphere in recent years owing to anthropogenic impacts on the climate. For this reason, the Leibniz Institute of Atmospheric Physics (IAP) has set its focus on measuring atmospheric wind and temperature profiles over large areas and up to altitudes of 120 km. To do this, it mainly uses mobile resonance LIDAR systems. When several such systems are used with overlapping observation areas, an array with unrivaled resolution and coverage is obtained. The data from these arrays are also acquired at remote locations under difficult environmental conditions, e.g. in polar or tropical regions, and are collected continuously over long periods of time. Therefore, rugged LIDAR systems must not only be compact, easy to transport and autonomous, but also require low maintenance.

Novel compact LIDAR system

Novel high-efficiency diode-pumped alexandrite lasers and innovative LIDAR technology were used to develop – in collaboration with Leibniz IAP – a novel compact LIDAR array (~ 1 m^3), a system that has the potential to be mass-produced at low cost.

European atmospheric LIDAR array

Fraunhofer ILT integrated the four prototype LIDAR emitters into the new systems with five fields of view and tested them extensively. The new systems are 50 x smaller and over 200 x more efficient than their predecessors. In measurements up to altitudes of more than 100 km, the new systems were demonstrated to be superior – even during the day. Furthermore, the robustness and freedom from maintenance have been confirmed in changing climatic conditions. The next steps will be commercializing the technology with a German industrial consortium and developing a European atmospheric LIDAR array. These steps will pave the way for continuous, area-wide observation of large-scale atmospheric processes to improve climate models and thus weather forecasting.

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