

TRans-siberian Observations Into the Chemistry of the Atmosphere (TROICA) –8: The Second CMDL Trace Gas Measurement Campaign in Russia

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The TROICA-8 expedition, which was successfully carried out in March 2004, is a continuation of the series of measurement campaigns on the Trans-Siberian railroad started in 1996. This expedition involved measurements of CFC-11, CFC-12, CFC-113, CH₃CCl₃, CCl₄, CHCl₃, and CBrClF₂, N₂O, CH₄, SF₆, CO, and H₂ by CMDL; CO, CO₂, CH₄, NMHC, radon, NO_x, and vertical temperature profile measurements by the Institute of Atmospheric Physics, Russia; and aerosols by Karpov Institute of Chemical Physics, Russia. A \$1M railroad carriage, specifically built for scientific research by the Russian Institute of Railroad Transport, was used for the first time (Figure 1). It was outfitted with wireless network connections, a satellite telephone and Internet capabilities, a high-accuracy GPS unit, a special observation dome on the roof and, most importantly, ample, reliable power with backup systems. The carriage is a dramatic improvement over the old observatory carriage used in previous TROICA expeditions.

For TROICA-8, CMDL provided a suite of stainless steel flasks and ACATS-IV, a portable 4-channel gas chromatograph designed for operation on research aircraft and capable of fast sampling rates (70- and 140-second sampling). ACATS-IV performed very well during the expedition covering over 8500 km of European and Asian parts of Russia. Over the 13-day trip both pristine and industrial areas were sampled clearly identifying pollution plumes from cities along the railroad. At this time, only the preliminary mixing ratios are available for compounds measured by ACATS-IV, but the qualitative examination of these data suggest that emissions of ozone depleting substances have decreased along the Trans-Siberian railway corridor since the 2001 TROICA-7 expedition.

With the availability of the new observatory carriage it may be possible to establish a CMDL “station on the rails” that would help in monitoring emissions and concentration of greenhouse and ozone depleting chemicals.



Figure 1. Russian scientific carriage used for TROICA-8.