Ural Federal University
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The possibility of NDACC FTIR measurements in Kourovka

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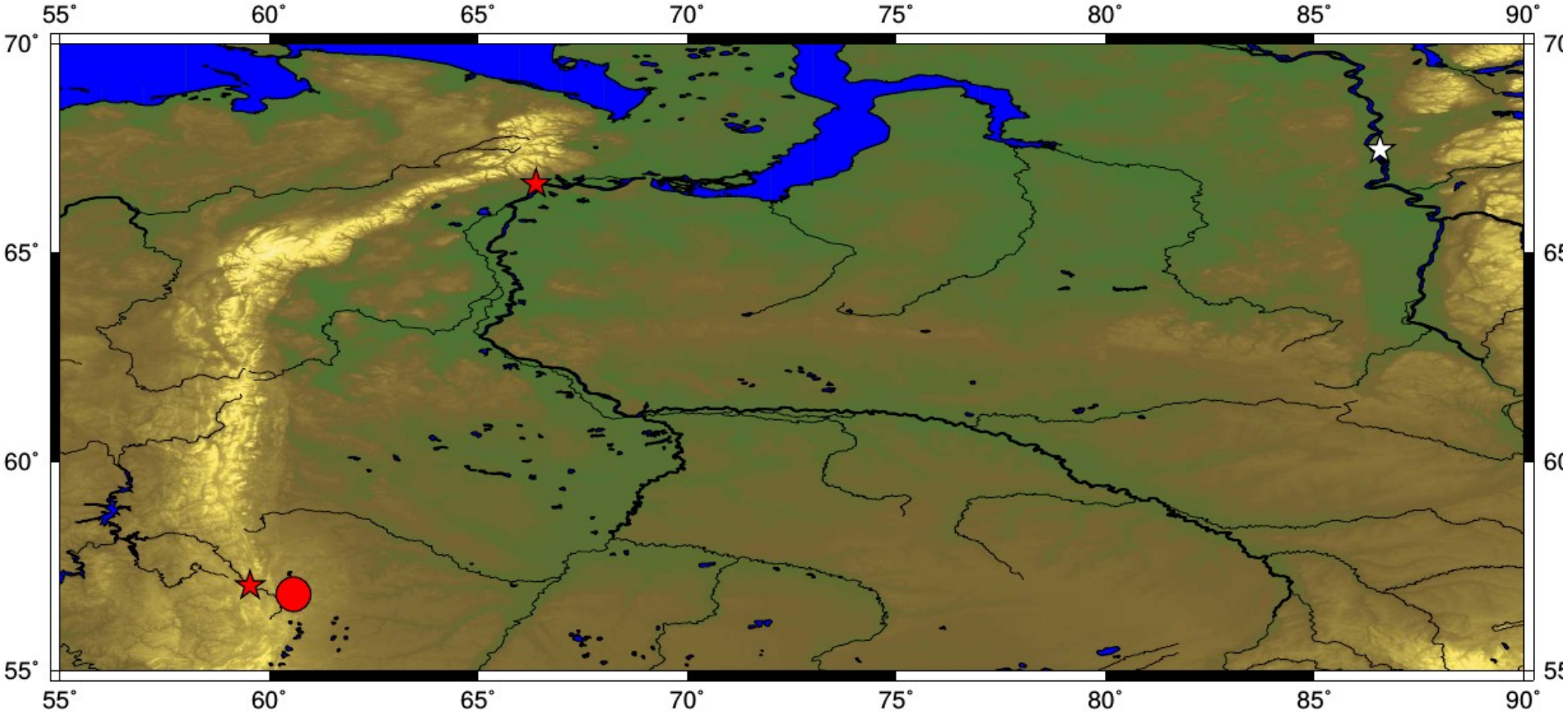
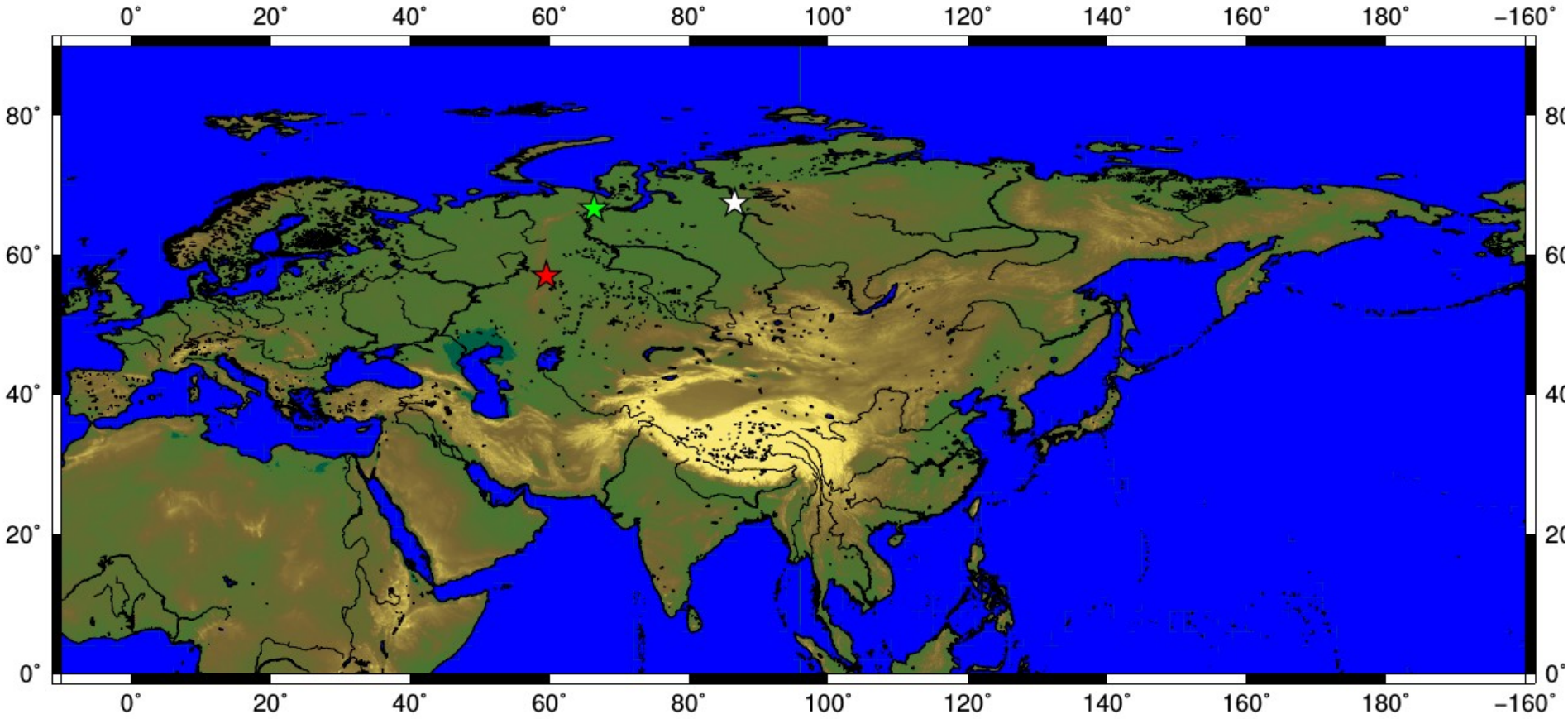
Western Siberia is declared as target area for Climate and Environment Physics Laboratory (CEPL)



CEPL observation sites: Kourovka (red star near red circle marking Yekaterinburg), Labytnangy (red star in the north of region), and Igarka planned site (white star). All sites are equipped (or planned to be equipped) with Picarro L2130-i analyzer measuring water isotopologues in atmospheric water vapor and automatic weather stations. Only Kourovka site is equipped with FTIR spectrometer.

Wider map to show locations of observation sites



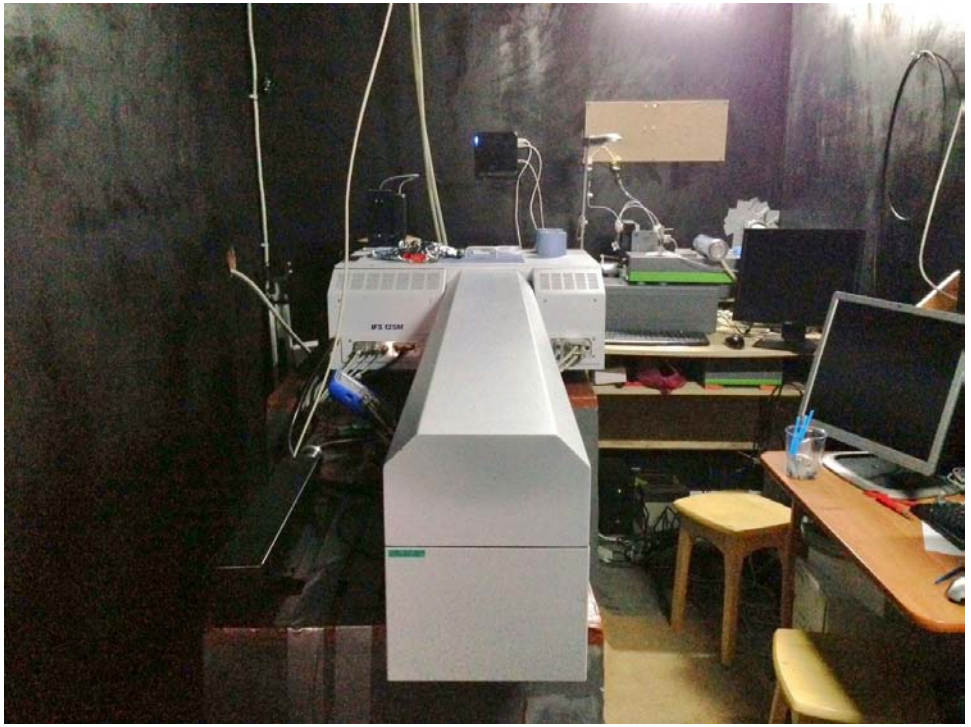
Red star is for **Kourovka**, 80 km west-north from Yekaterinburg, green star is for **Labytnangy**, white star is for planned site in **Igarka**, installation of Picarro L2130-i and automatic meteo station is planned in the summer of 2015

Kourovka observation site

Kourovka observation site is arranged on the territory of Kourovka astronomical observatory of Ural Federal University (white dot on the map) located on the top of the hill (approx. 300 m above sea level) in wild forest with background atmospheric condition. Nearest large city is Yekaterinburg (80 km east-south).

Some views of Kourovka astronomical observatory

Bruker Optics IFS125M at Kourovka observation site



Spectrometer is equipped with options which meet the the following requirements of IRWG protocol for infrared FTIR:
- maximum OPD >= 250 cm;
- spectral range is wider than 700 – 4100 cm^{-1};
- full spectra can be recorded approx. in 1 minute (at highest scanning speed);
- continuous spectral coverage in small number of filter bands.

Three web cameras provide remote control for solar tracker dome, spectrometer light input entrance and position of the sun image on the input aperture.

What needs to be done to meet NDACC requirements

1. Liquid nitrogen can be delivered in Dewar vessels from Yekaterinburg, and timely regular delivery can be organized. However, filling of liquid N2 in vessels of detectors can be performed only manually in spite of the fact that at present our spectrometer, solar tracker and its dome have full remote access and remote control.

2. It is necessary to purchase black body sources for radiometric calibration.

3. HBr cell should be purchased.

4. Delivery of our instrument to the location of other instrument for intercomparison measurements seems most difficult task for CEPL. It seems almost impossible at this time.

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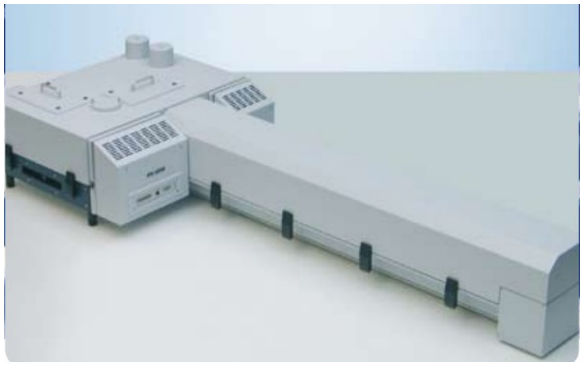
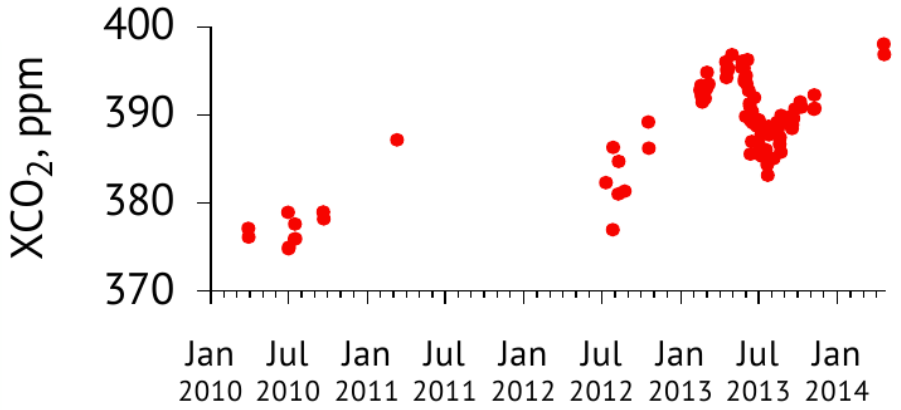
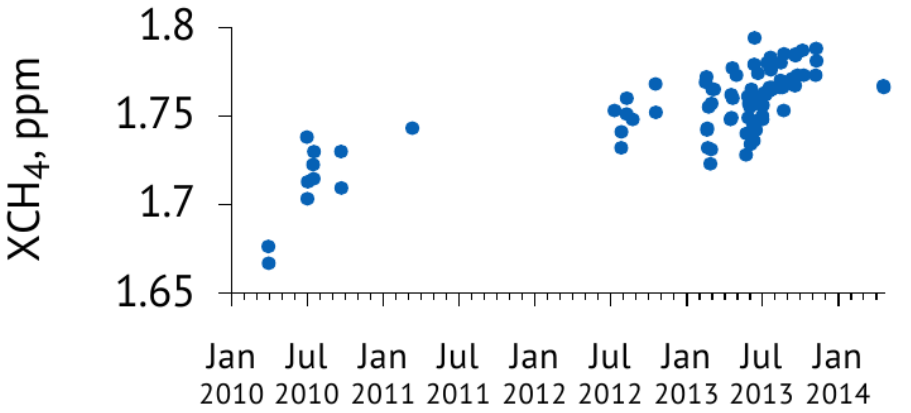


= ?

(Scrap metal heap?)

Current activity related to FTIR at CEPL (briefly)

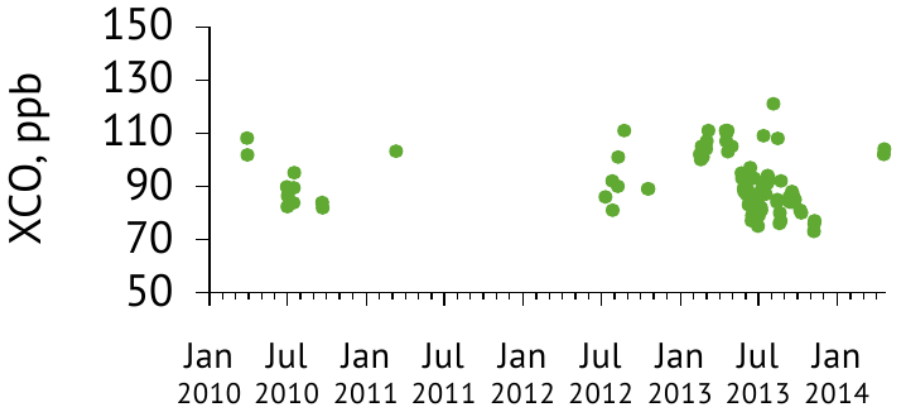




We accumulate series of spectral measurements when possible (using remote control) and retrieve dry columnar ratios of the following gases: CO_2, CH_4, CO, N_2O, HF, HCl, H_2O, HDO. TCCON software, procedures and spectral windows are used.

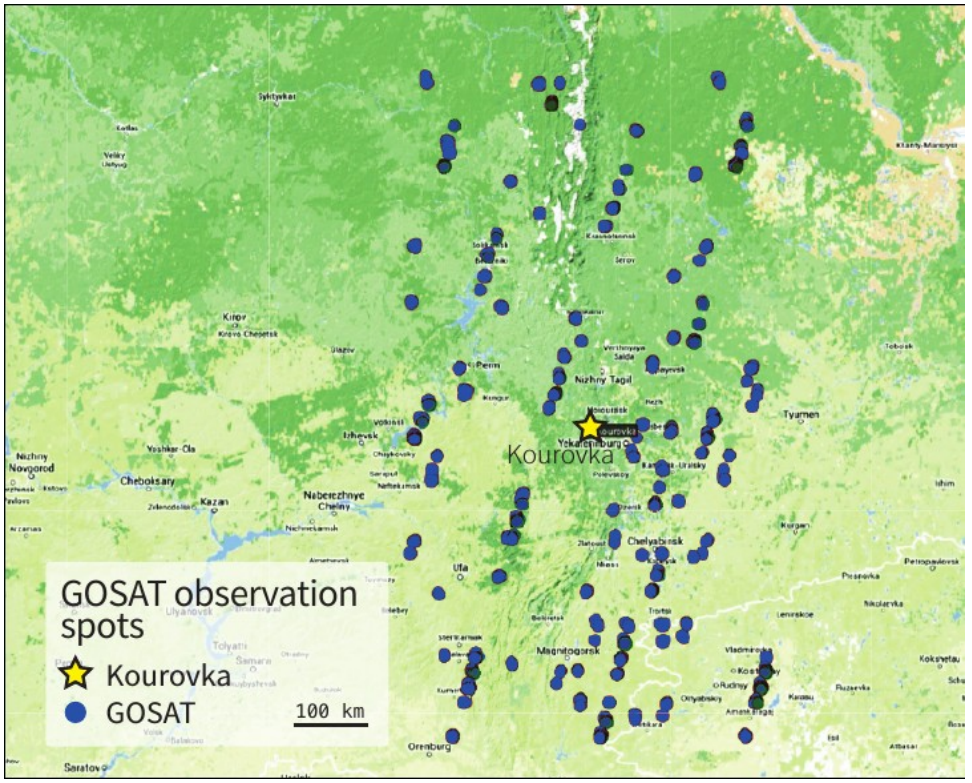
Our attempt to join TCCON is suspended now because we are not assured in stability of our instrument. Second reason, we can not measure in Decemper and January because of low Sun elevation angle and high trees.

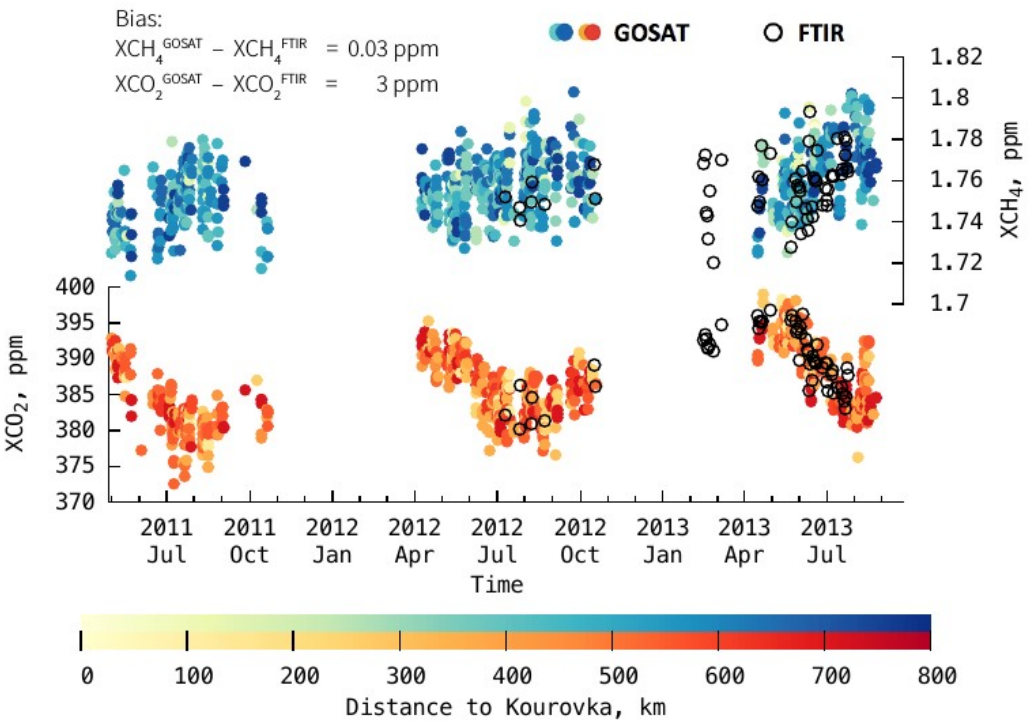
Joining NDACC will stop our almost TCCON observations.



We develop method for $\delta^{18}O$ and δD retrieval from FTIR measurements, see **N.Rokotyan et al., AMT, 2014** for details

First attempt to validate our FTIR measurements





We used GOSAT Level 2 standard products for XCO2 and XCH4 and compared with our retrievals from measurements of the same day. There are no exactly collocated GOSAT measurements, so we use all GOSAT spots from relatively large neighborhood. Results are reported in **N.Rokotyan et al., IRWG/TCCON meeting, 2014.**

What else at CEPL can be useful for NDACC community

CRDS instruments Picarro L2130-i together with automatic meteorological stations are installed in Kourovka and Labytnangy and perform continuous (once per second) high precision measurements of H_2O, δHDO and $\delta H_2{}^{18}O$. Precipitation (rain, hail and snow) are collected for on daily basis and then analyzed using liquid system based on the same CRDS analyzer Picarro L2130-i. The same set of equipment is planned for the installation in Igarka.

We have CRDS analyzer Picarro G2401 intended for in situ measurements of CO_2, CH_4, CO and H_2O and plan to install it in some observation site.

CEPL recent activity in isotopologues measurements for climate model validation is represented in **K.Gribanov et al., ACP, 2014**, **V.Bastrikov et al., AMT, 2014**, **N.Rokotyan, AMT, 2014**, **V.Gryazin et al., ACP, 2014**, **M.Butzin et al., ACP, 2014**, and **M.Pommeir et al., AMT, 2014**.

Conclusions

1. It is possible to improve equipment and management of UrFU Kourovka observation site to start joining to Infrared working group of NDACC.

2. Regular thermal infrared measurements will stop near infrared measurements because CEPL has the only FTIR instrument. Near infrared and thermal infrared measurements require different beamsplitters and detectors. Alternatively, thermal infrared measurements can be performed periodically in the frame of campaigns when personnel will operate manually.

3. CEPL members are open for discussions on what other instruments can be installed at our all observation sites. Robotic and requiring less maintenance instruments are preferable for Labytnangy and Igarka.

4. We need for good rationales for preparation proposals for funding CEPL activity for NDACC .


Thanks a lot for your attention !