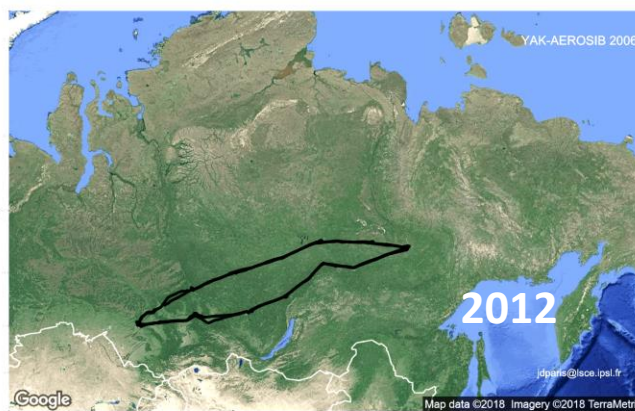


YAK-AEROSIB

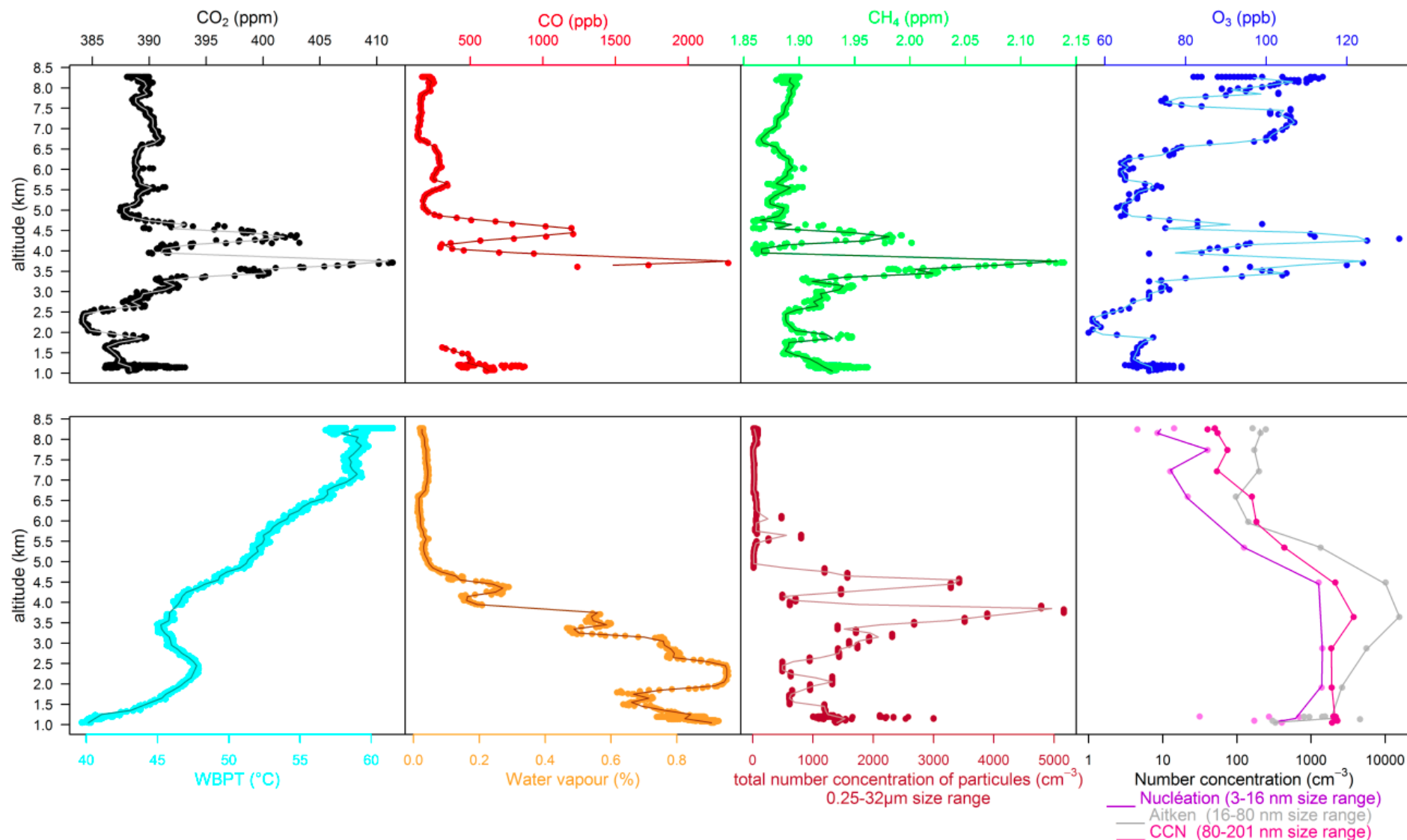
Airborne Extensive Regional Observations in Siberia

Jean-Daniel Paris, Ph Ciais (LSCE, France),
Boris D. Belan, Mikhail Yu. Arshinov, I. Penner,
G. Kokhanenko, Yu! Balin (IAO-SB-RAS, Russia)
G rard Ancellet, Kathy Law, J. Pelon (LATMOS, France)
Ph N d lec (LA, France)
And many other colleagues in France, Russia, Norway, UK...
<https://yak-aerosib.lsce.ipsl.fr/>

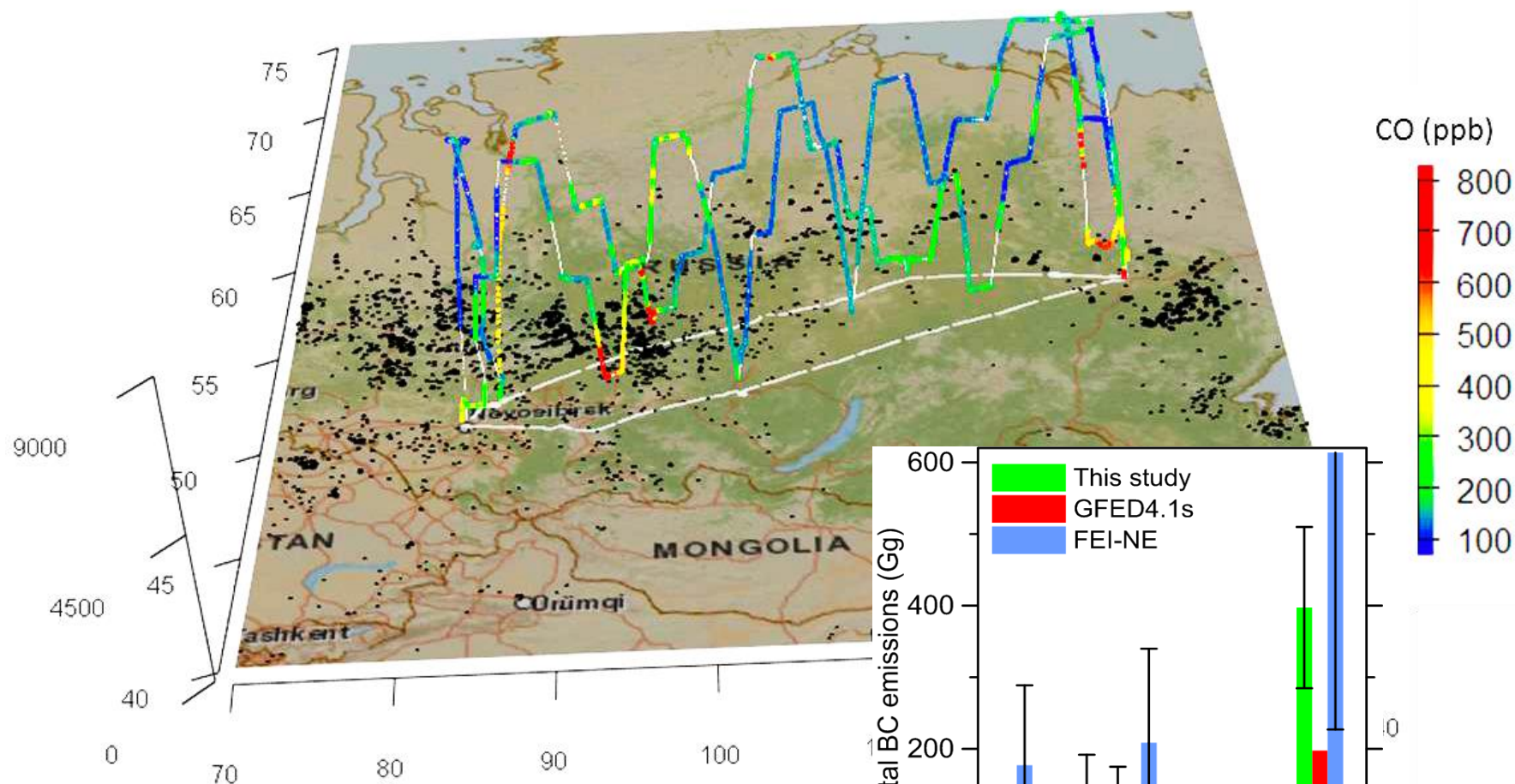




Vertical profile in young wildfire plume, 2012



2012 campaign – boreal forest fires



Pruvost et al., 2014

Konovalov et al., 2018, in rev.



Octobre 2014 campaign

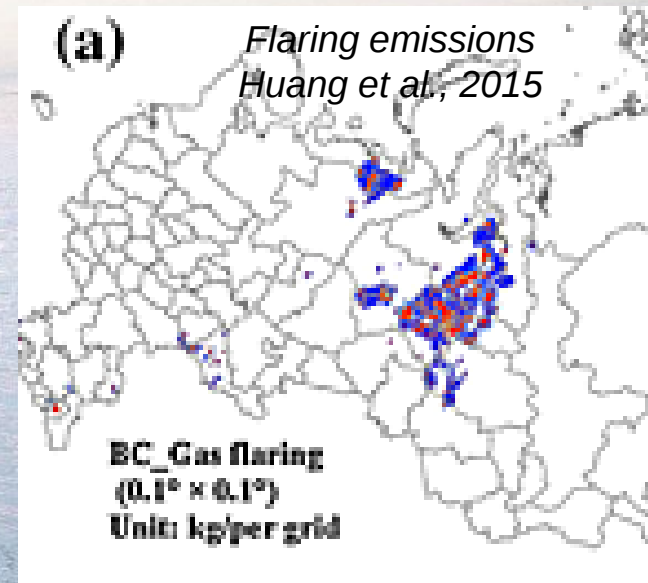
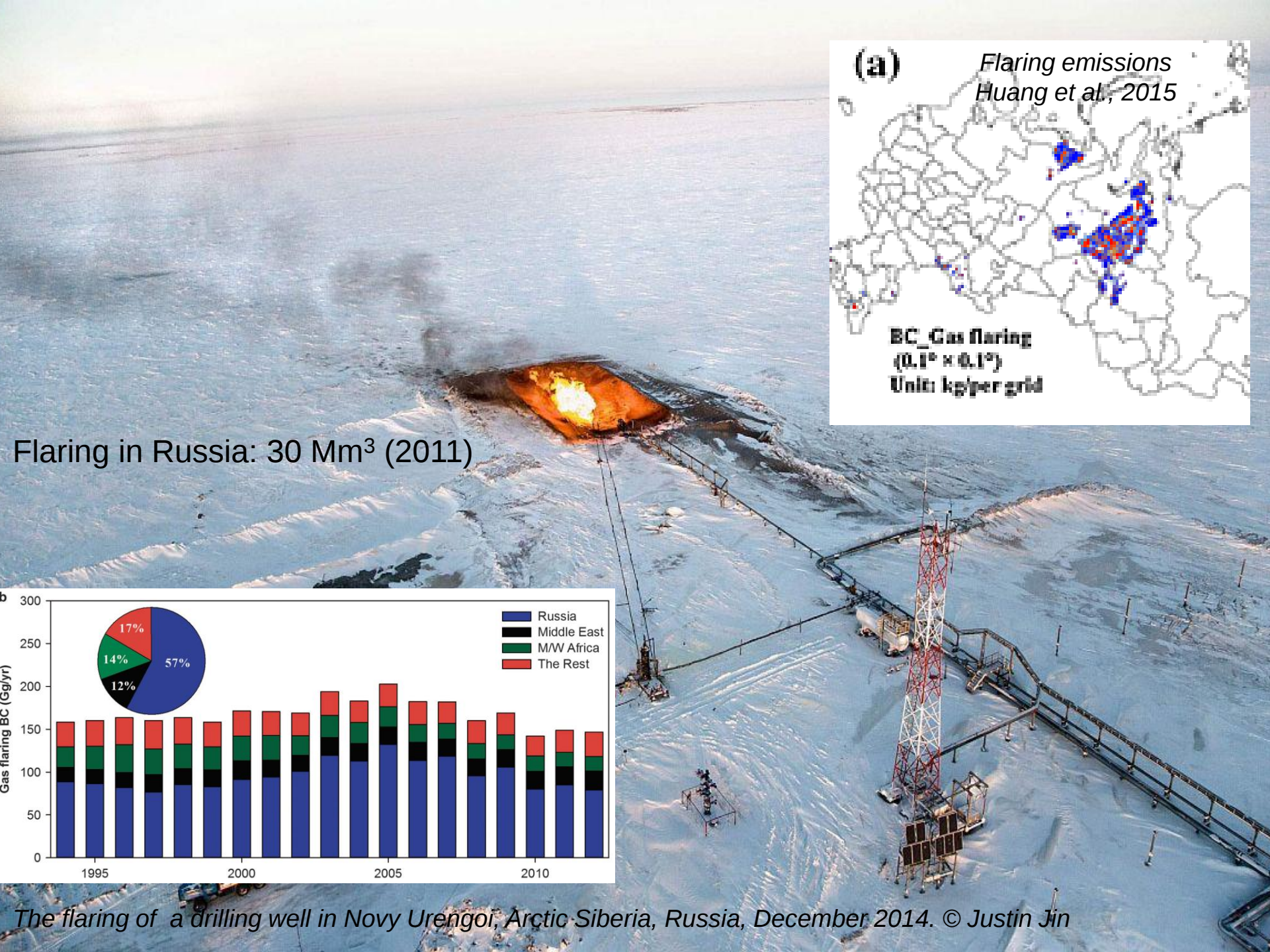
Nightlights

NASA 2012 black marble

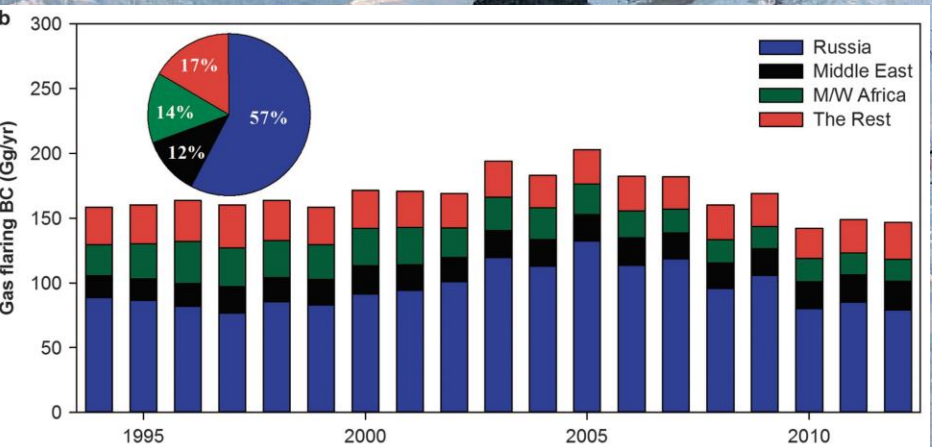
Flight altitude as color

(low-mid-high)





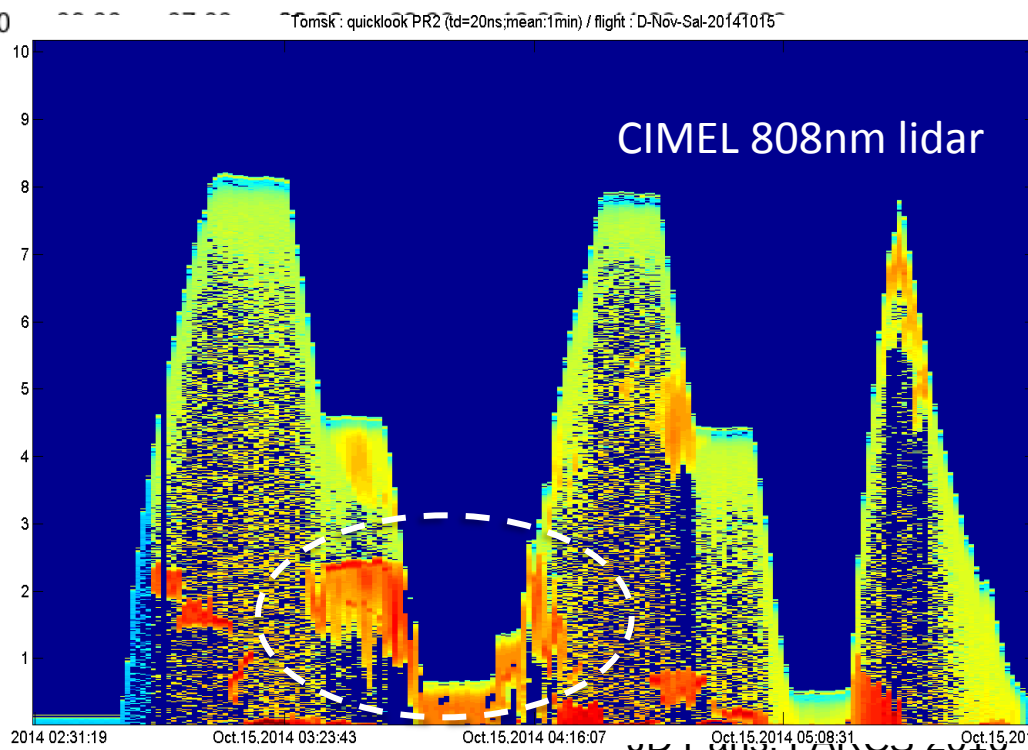
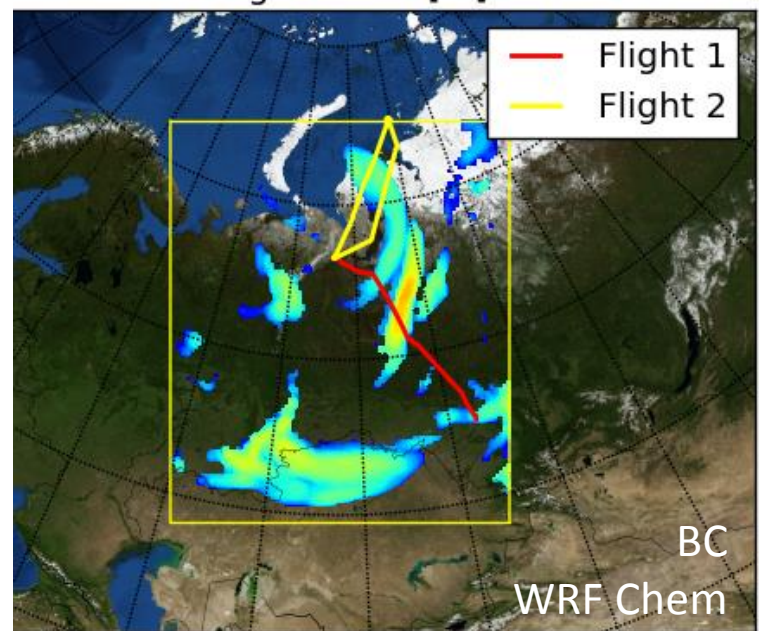
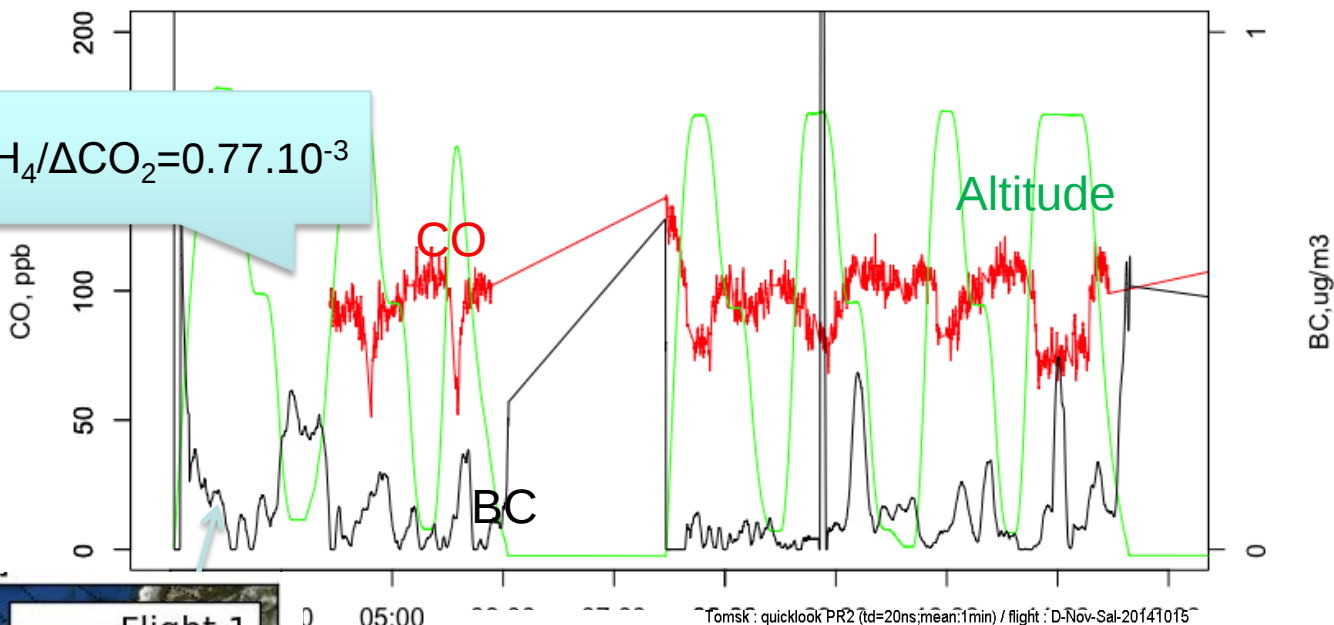
Flaring in Russia: 30 Mm³ (2011)



The flaring of a drilling well in Novy Urengoi, Arctic Siberia, Russia, December 2014. © Justin Jin

Black carbon and CH₄ from flaring

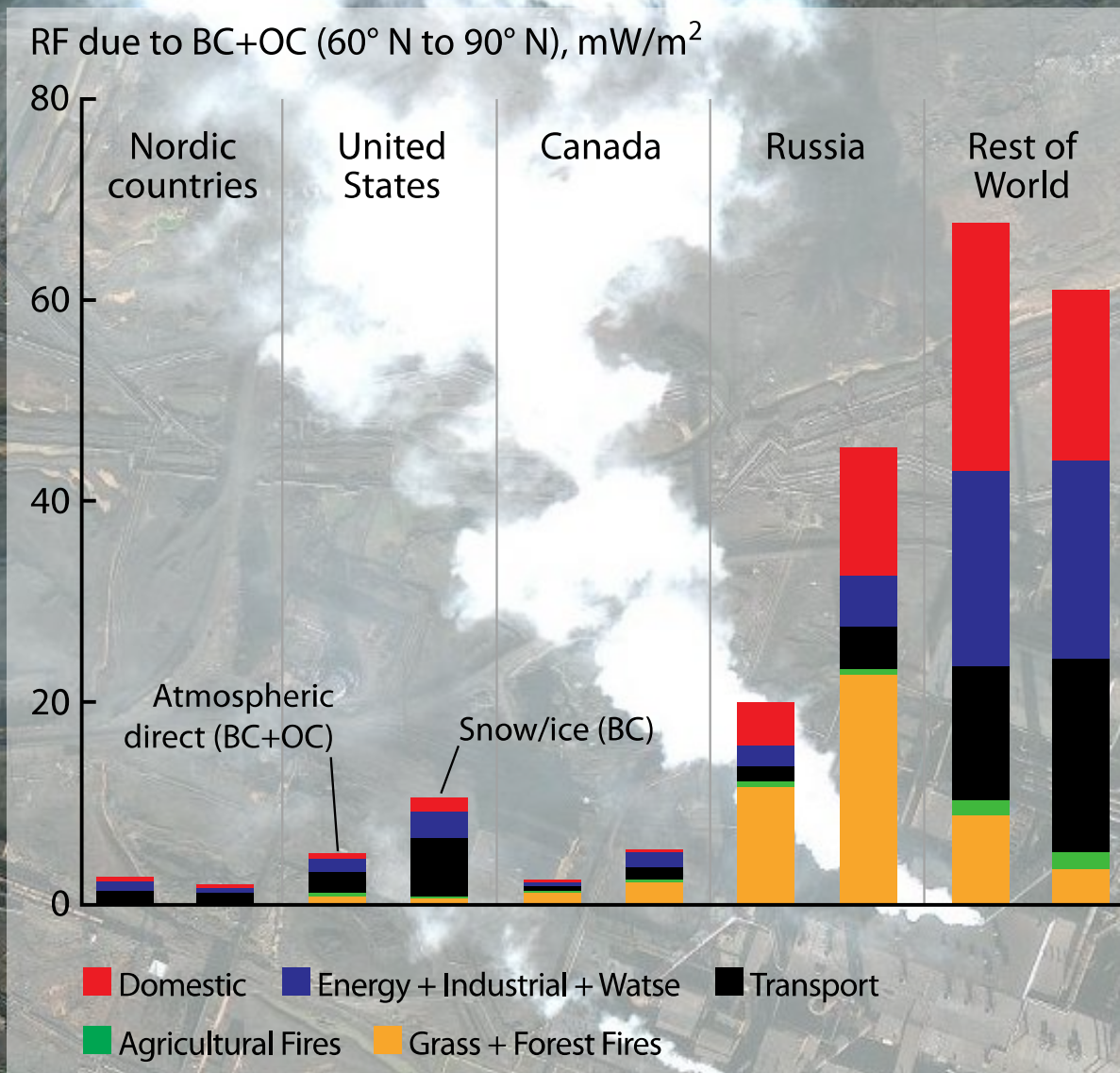
$$\Delta\text{CH}_4/\Delta\text{CO}_2 = 0.77 \cdot 10^{-3}$$





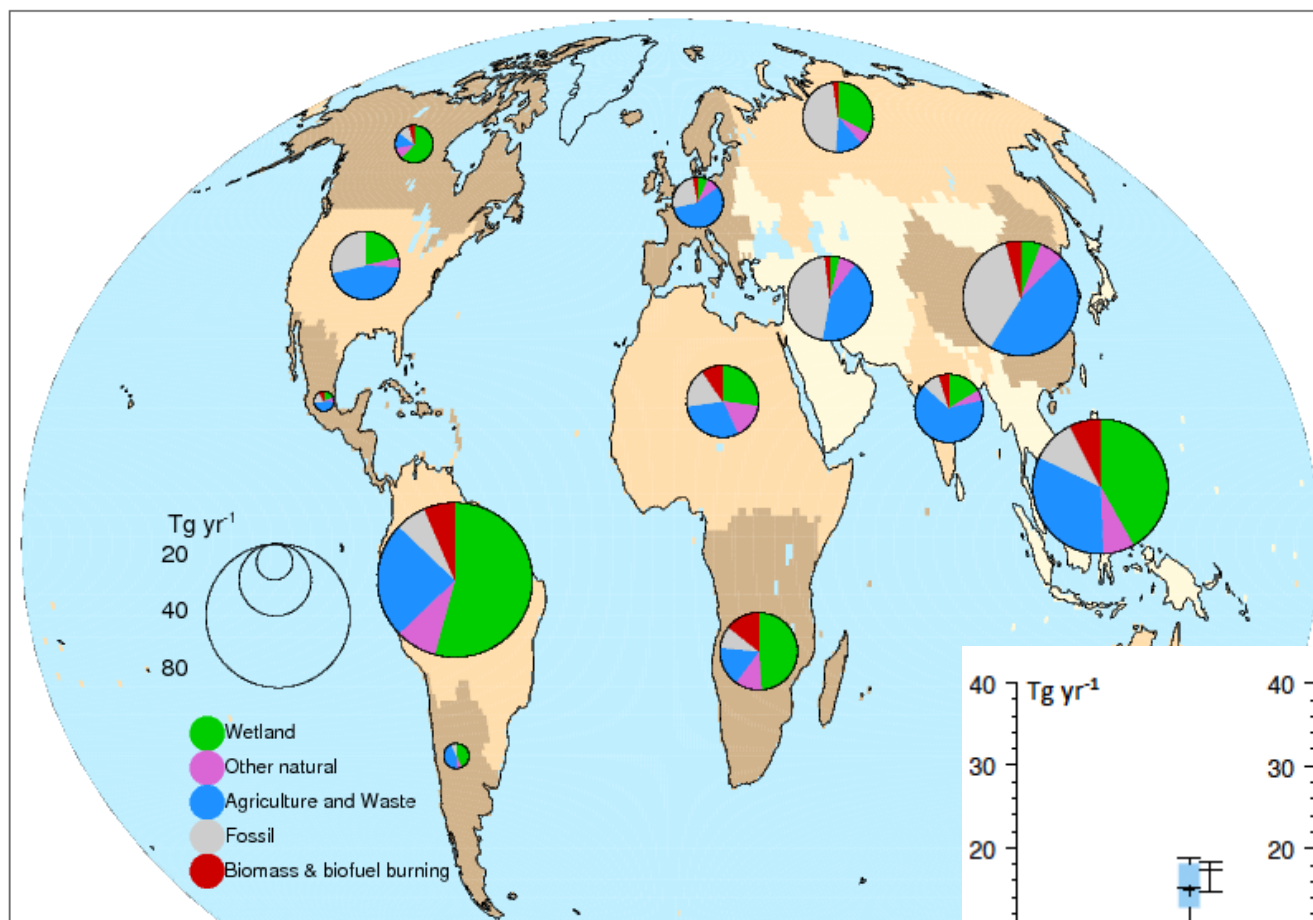
Thanks to our Russian colleagues at IAO Tomsk



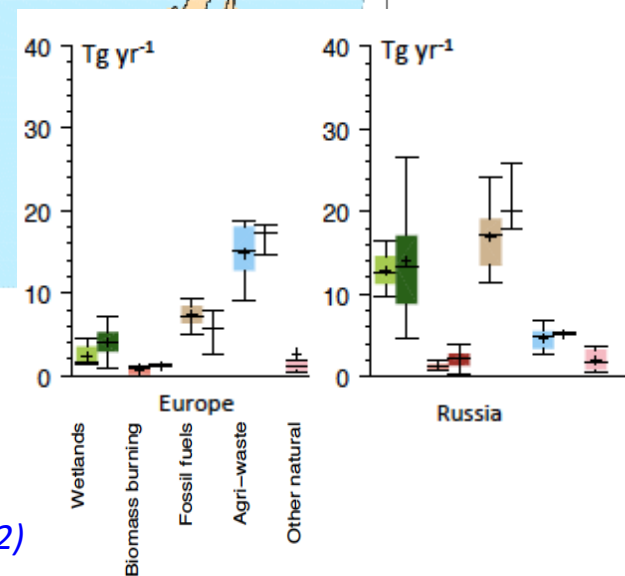


AMAP 2011 Black Carbon in the Arctic

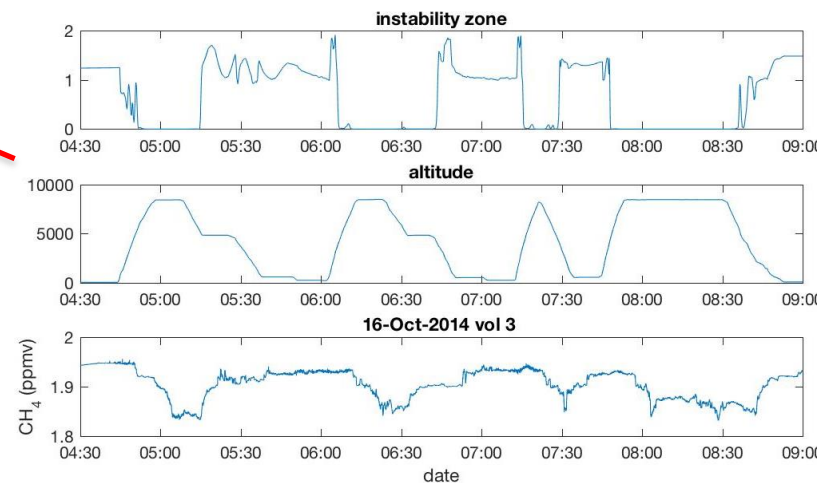
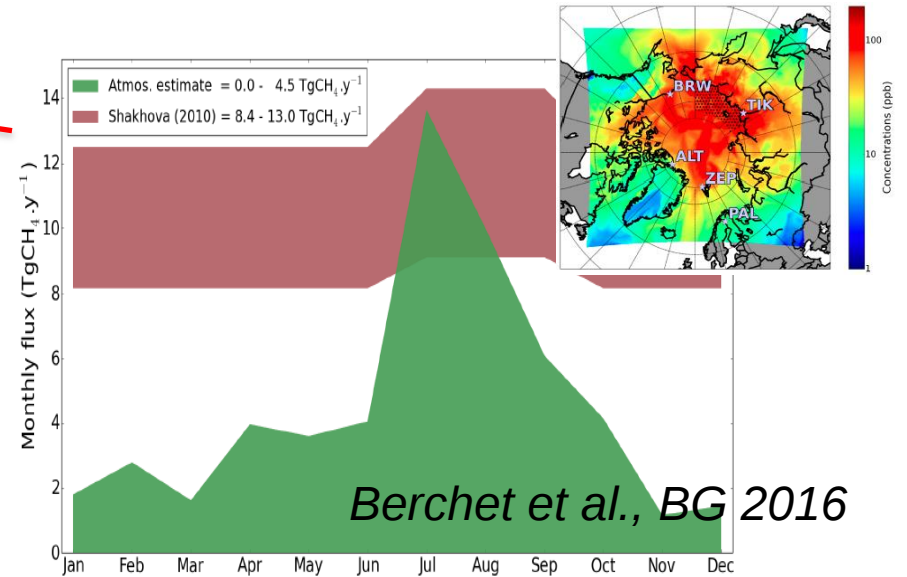
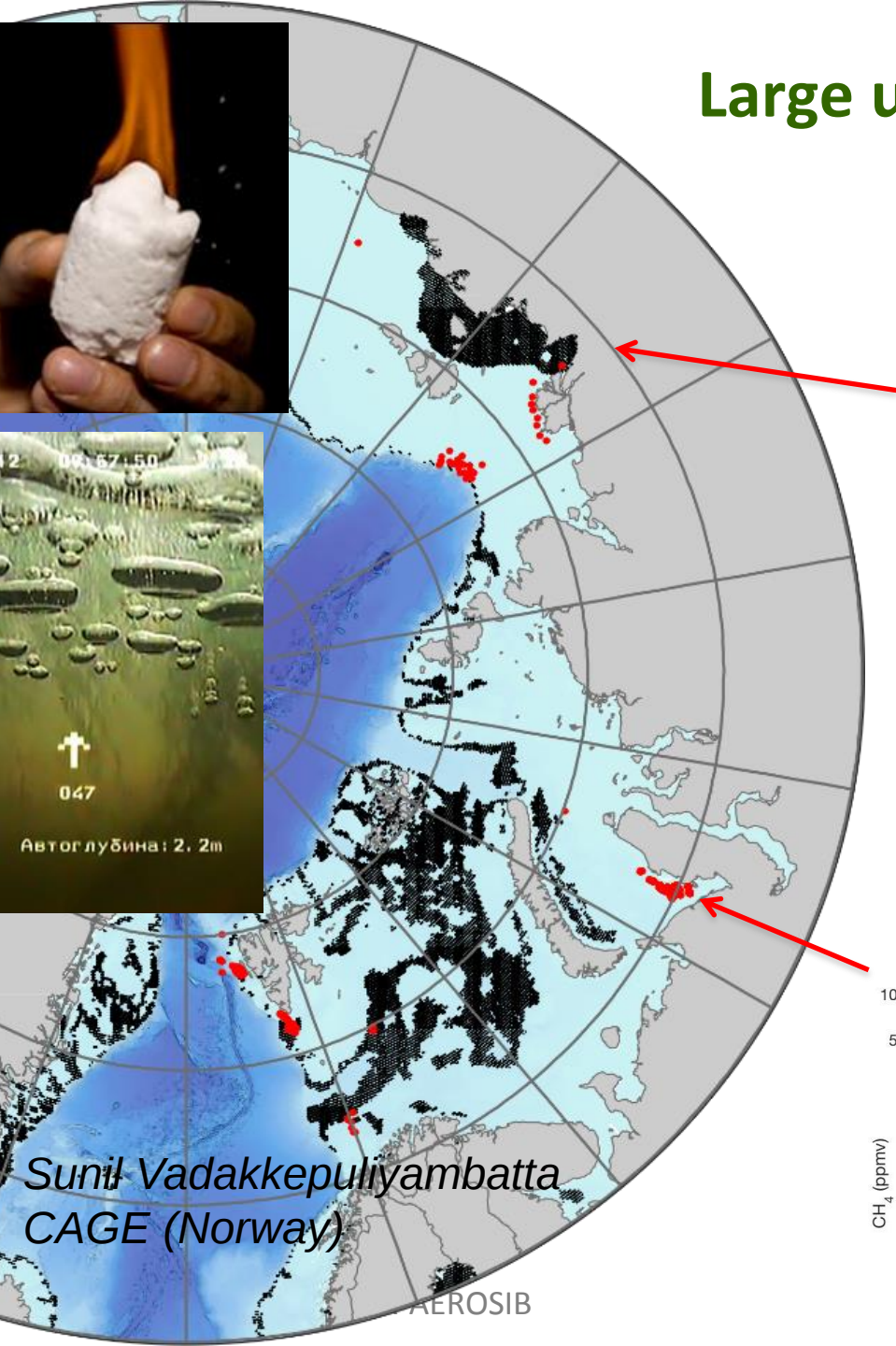
Regional Methane Sources (2003-2012)



- Anthropogenic sources are responsible for 60% of global emissions.



Large uncertainties on sources from subsea methane (clathrate)



Paris et al., EGU 2017

Integrated Carbon Observing System research infrastructure

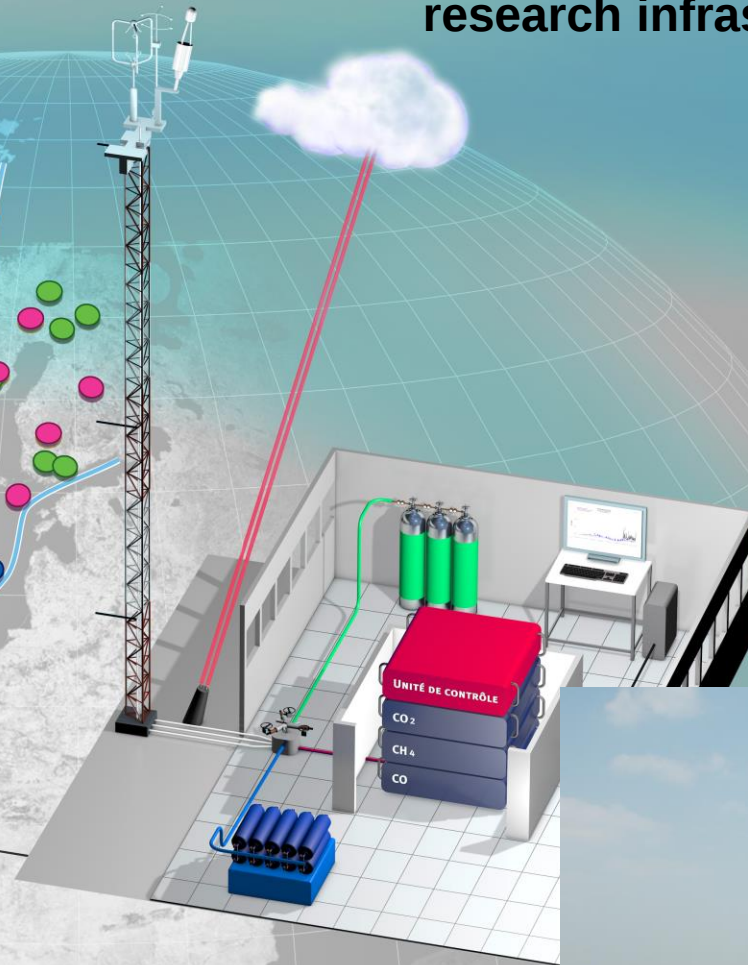
- EU ESFRI flagship
RI for greenhouse
gases monitoring

- Atmospheric,
ecosystems and
oceans

- Atmospheric
Thematic Center at
LSCE (Saclay)

- More sites needed
across Eurasia

- Fonoviyie site ICOS
compliance under
study



All data:
Vertical mean
Profile by flight

Paris et al.,
BAMS 2010

