

# Monitoring at Norwegian-Russian cross-border territories (new data April 2010 - March 2011)

Tore Flatlandsmo Berglen  
([tfb@nilu.no](mailto:tfb@nilu.no))



**The Norwegian-Russian seminar:**

**Interaction between governmental structures, business, academia and civil society – an instrument for improving environmental safety in the region**

**26.-27. October 2011**



# Outline

- **Norwegian monitoring program; Svanvik, Karpdalen, Viksjøfjell, Karpbukt**
- **Results from April 2010 – March 2011**
- **Model development**
- **Emissions**



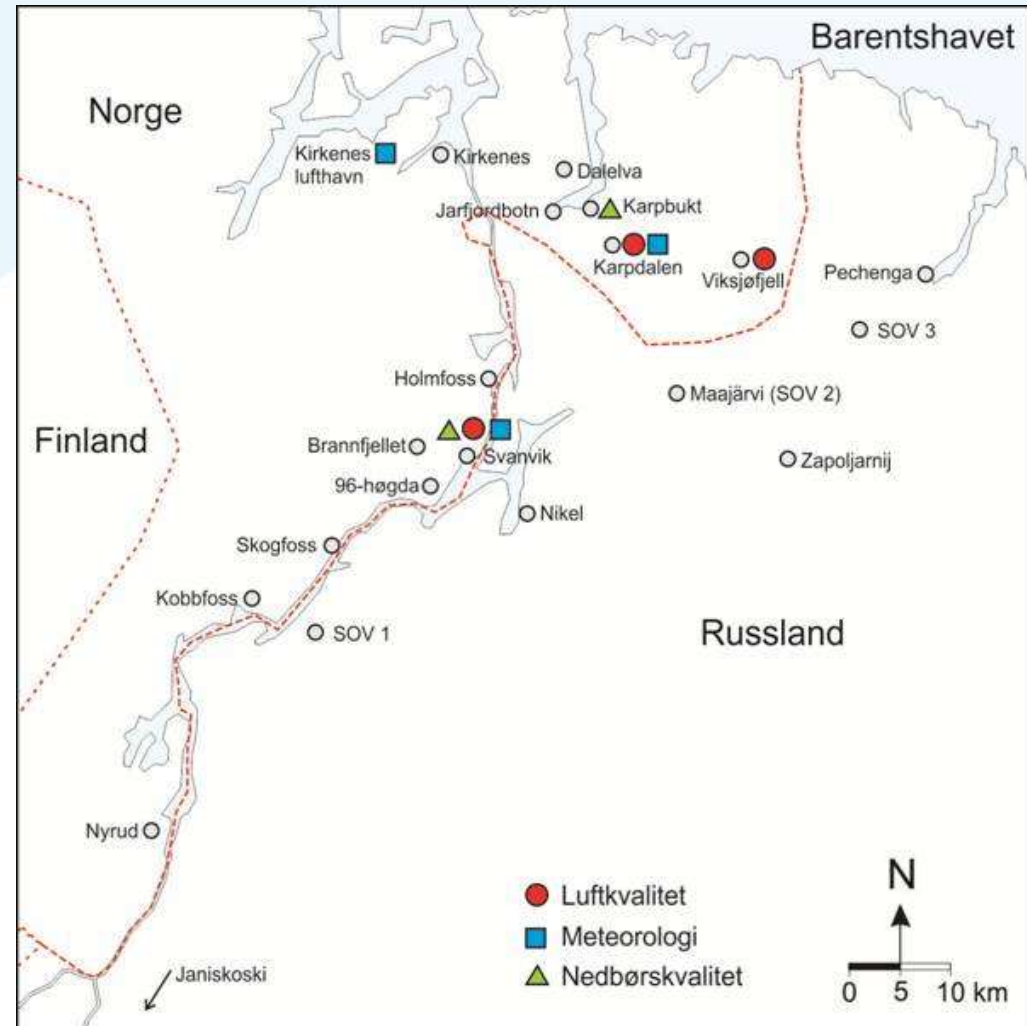
Photo: Hildur Eikås,  
Sør-Varanger library

# Norwegian monitoring program



**KLIMA- OG  
FORURENSNINGS-  
DIREKTORATET**

**MILJØVERNDEPARTEMENTET**





# Svandvik (Сванвик)

- SO<sub>2</sub> monitor
- Heavy metals in air/particles
- Heavy metals in precipitation
- Meteorology
- Results on [www.luftkvalitet.info](http://www.luftkvalitet.info)
- In collaboration with Bioforsk Soil and Environment

# Karpdalen (Карпдален)

- SO<sub>2</sub> monitor
- Meteorology
- Heavy metals in air/particles from autumn 2011
- Results on [www.luftkvalitet.info](http://www.luftkvalitet.info)
- In collaboration with Leif Vonka



# Norwegian threshold values

- SO<sub>2</sub> hourly mean: 350 µg/m<sup>3</sup> (24 exceedances per year)
- SO<sub>2</sub> daily mean: 125 µg/m<sup>3</sup> (3 exceedances per year)
- SO<sub>2</sub> seasonal mean/annual mean: 20 µg/m<sup>3</sup>



# Важные ключевые показатели SO<sub>2</sub> из измерений 1 апреля 2010 г.-31 марта 2011г

Параметр	Сванвик	Карпдален
Наивысший 10-минутный показатель $\mu\text{г}/\text{м}^3$	620	917
Наивысший среднечасовой показатель $\mu\text{г}/\text{м}^3$	433	854
Количество среднечасовых показателей $>350 \mu\text{г}/\text{м}^3$ летом	6	4
Количество среднечасовых показателей $>350 \mu\text{г}/\text{м}^3$ зимой	0	102
Наивысший среднесуточный показатель летом $\mu\text{г}/\text{м}^3$	156	94,9
Наивысший среднесуточный показатель зимой $\mu\text{г}/\text{м}^3$	96	507
Количество среднесуточных показателей $> 125 \mu\text{г}/\text{м}^3$	1	15
Количество среднесуточных показателей $> 90 \mu\text{г}/\text{м}^3$	6	20
Средний показатель лета $\mu\text{г}/\text{м}^3$	7,4	9,4
Средний показатель зимы $\mu\text{г}/\text{м}^3$	8,5	39,1

# Viksjøfjell (Викшёфьелл)

- SO<sub>2</sub> passive samplers (exposed 2 weeks)
- Average concentration winter 2010/2011 30 µg/m<sup>3</sup>



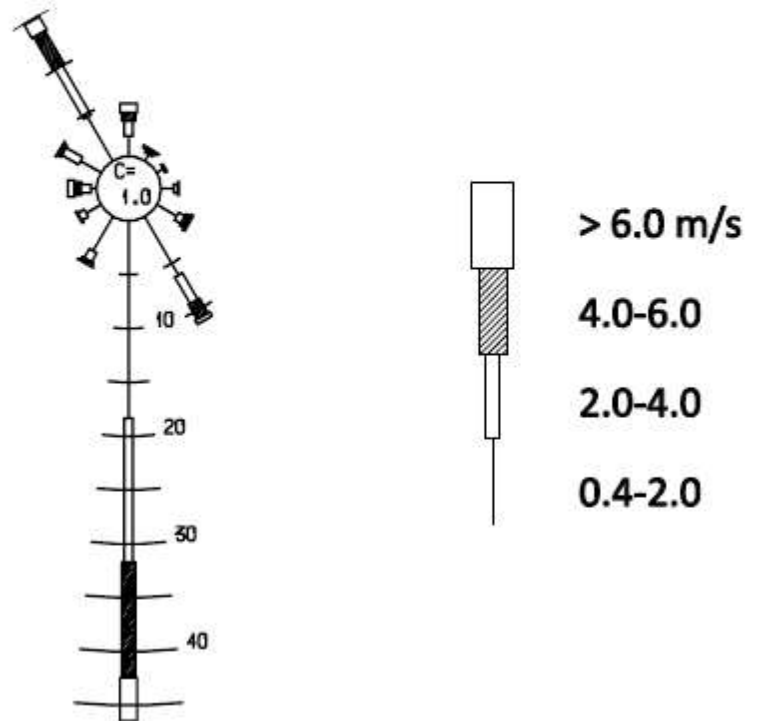
View from Viksjøfjell southwards. One can see the flue gas from stack in Zapoljarnij. Photo: Christoffer Aalerud, County governor of Finnmark



# Meteorology

- Karpdalen (Карпдален)
- Prevailing wind direction from south during winter (2/3 of the time)

Stasjon: Karpdalen  
Periode: 1.10.10 - 31.3.11  
Vinter



# Heavy metals

- Svanvik (СВАНВИК)
- Ni, As, Cu and Co trace metals from smelter activity
- Increased levels in precipitation from 2004

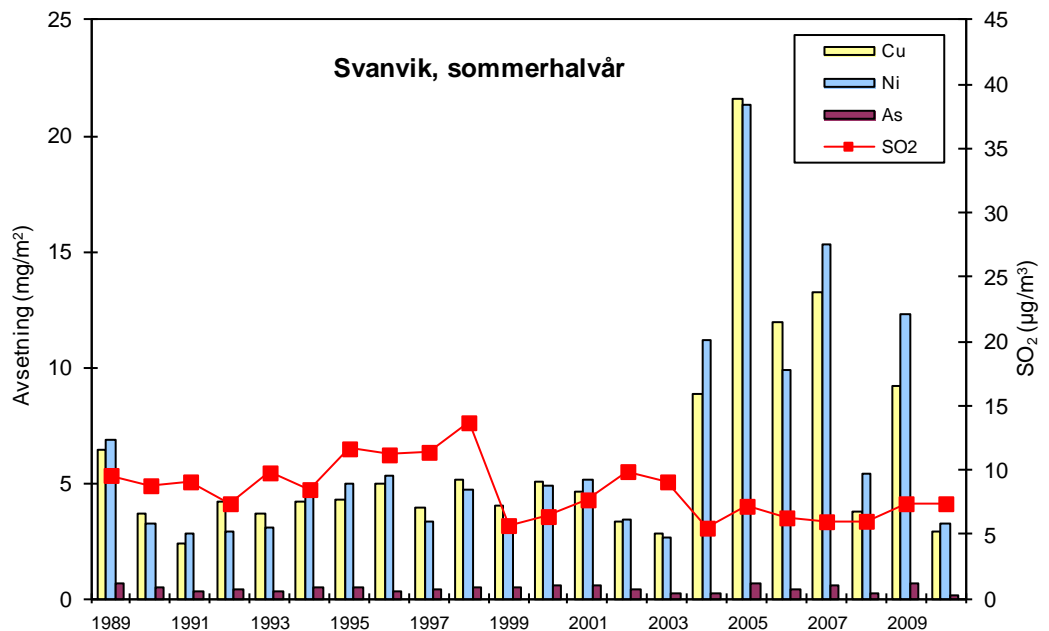
Max daily values in  
air 2010/2011:

**Ni:** 66,90 ng/m<sup>3</sup>

**As:** 25,25 ng/m<sup>3</sup>

**Cu:** 37,31 ng/m<sup>3</sup>

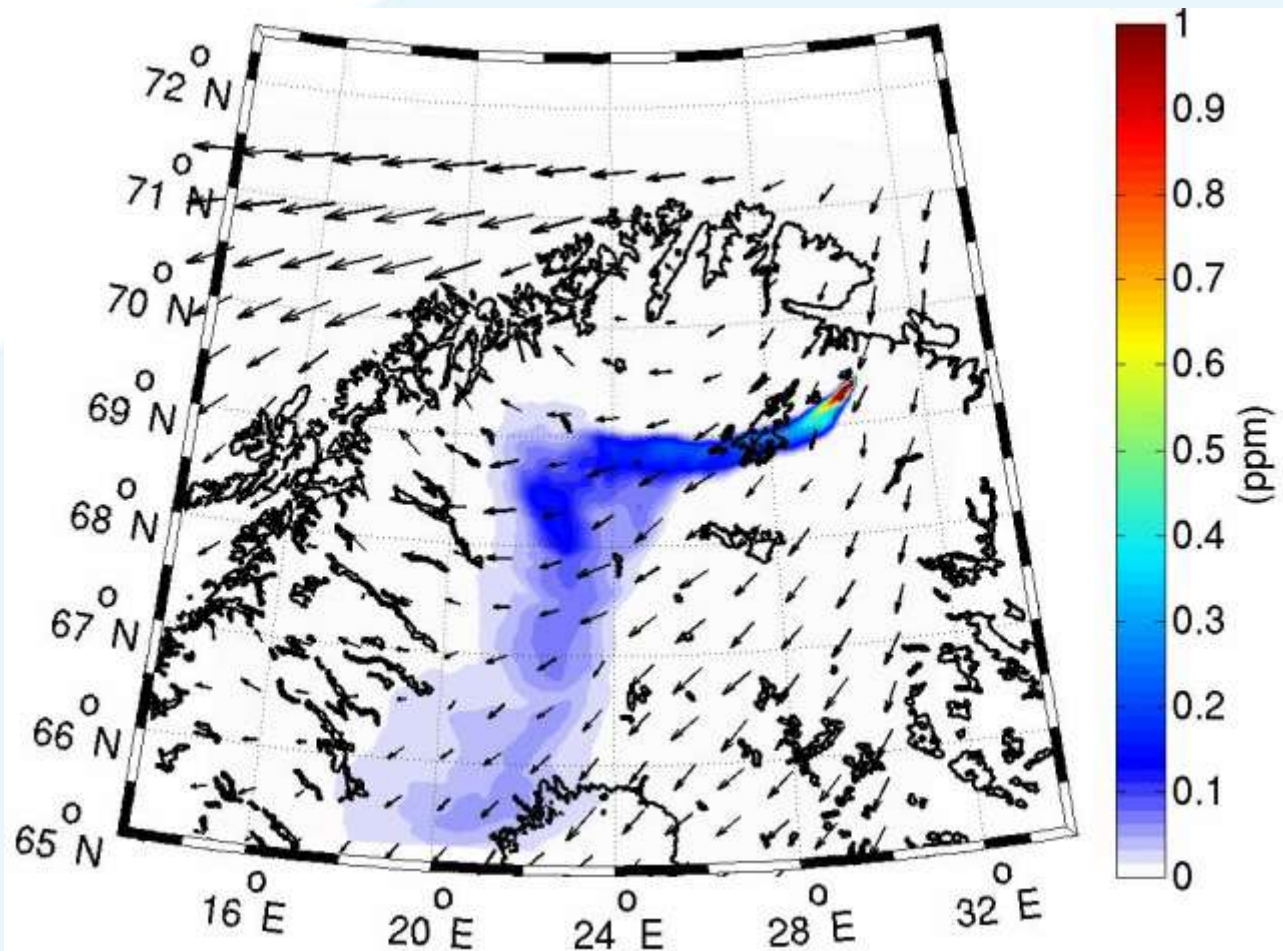
**Co:** 2,16 ng/m<sup>3</sup>



Deposition of heavy metals at Svanvik, summer season

# Model development

- WRF-Chem (NILU and University of Oslo)



6th July 2007 at 00h

# Model development

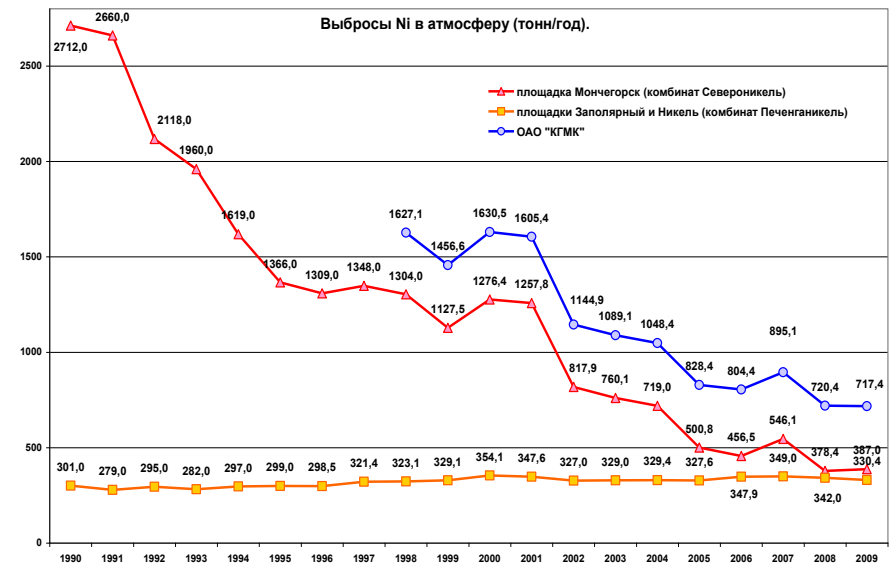
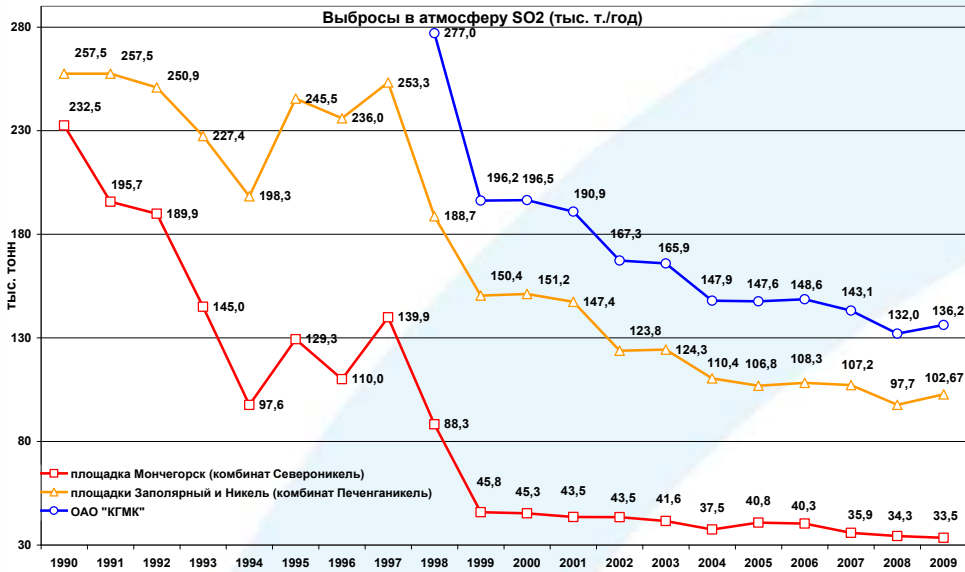
**NILU and University of Oslo are working on development of WRF-Chem atmospheric-chemistry model to investigate dispersion and deposition from Nikel and Zapoljarnij**

[http://folk.uio.no/torefl/WRF-Chem/Domene3\\_SO2-SO4\\_delay10.gif](http://folk.uio.no/torefl/WRF-Chem/Domene3_SO2-SO4_delay10.gif)

[http://folk.uio.no/torefl/WRF-Chem/Domene2\\_SO2-SO4\\_delay10.gif](http://folk.uio.no/torefl/WRF-Chem/Domene2_SO2-SO4_delay10.gif)

[http://folk.uio.no/torefl/WRF-Chem/Domene1\\_SO2-SO4\\_delay10.gif](http://folk.uio.no/torefl/WRF-Chem/Domene1_SO2-SO4_delay10.gif)

# Emissions



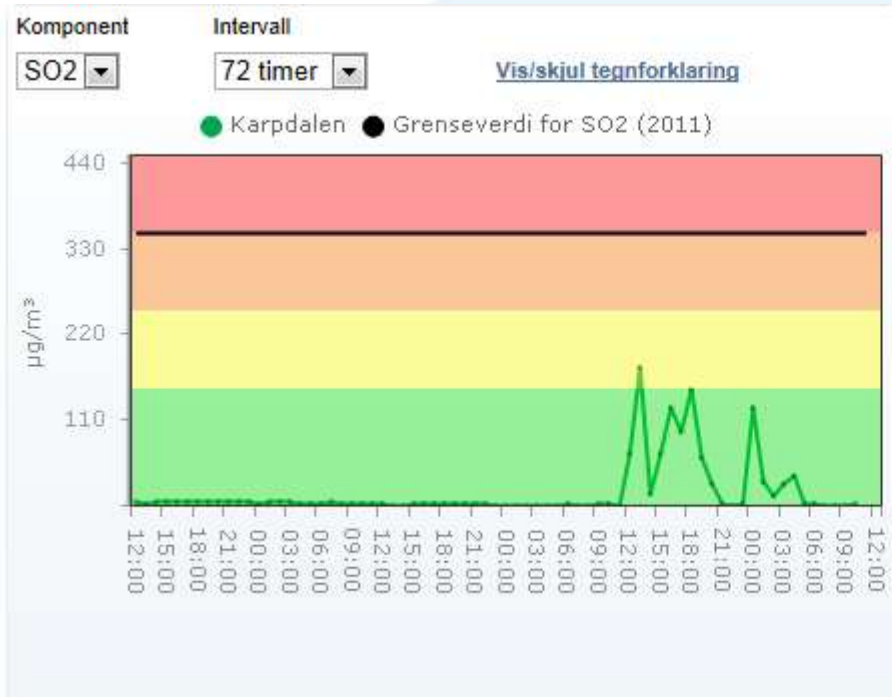
From Kola MMC. Thanks to Bellona for sending the numbers

# Diffusive emissions: Smelter and city of Nikel 19. June 2008



Hourly mean concentrations in Nikel (NILU instrument):  
1470  $\mu\text{g}/\text{m}^3$  (13h-14h) and 1527  $\mu\text{g}/\text{m}^3$  (14h-15h).





## Karpdalen

Stasjonen ligger i Karpdalen, øst for Kirkenes og nord for smelteverket i Nickel, Russland. Dette er en "gammel" stasjon som ble nedlagt i 1999 og gjenåpnet høsten 2008. SO2 og meteorologi måles. Om vinteren er dominerende vindretning fra sør og sør-sørvest. Da bringes utslippene fra Nickel nordover mot Karpdalen og Jarfjordfjellet.



**Status:** Stasjonen er i normal drift.  
**Eiet av:** NILU (målinger på oppdrag fra KLIF)

## Detaljer

- [Se kart](#)
- [Se luftkvalitets index \(Tabell\)](#)
- [Se luftkvalitets data \(Tabell og graf\)](#)

# Summary (outline)

- Norwegian monitoring program; Svanvik, Karpdalen, Viksjøfjell, Karpbukta
- Results from April 2010 – March 2011
- Model development
- Emissions

Tore Flatlandsmo Berglen  
([tfb@nilu.no](mailto:tfb@nilu.no))



Photo: Hildur Eikås,  
Sør-Varanger library