Coal Mines Hydrogen

- What is its origin in coal mines
- Links between hydrogen and methane emissions
- Some hydrogen properties
- Hydrogen in atmosphere and GHG effect
- Safety needs with respect of mining works and greenhouse effect

Hydrogen emission from air-oxidized coal fines

(Reports published in 1991-2005)

***The coals studied*:**

Carboniferous from Germany, Poland & USA

Permian from Australia & S. Africa

Tertiary from Colombia

Majority of the coals generate hydrogen during low-temperature oxidation

One t of coal fines can generate
<u>At least</u> few dozens litres of hydrogen
During 2-3 initial days of sample/air contact

Our experiments in 2000-2004:

31 coal samples from 12 mines were studied

Series 1:

- ***Desorption of gases occuring in coals 50^0 C; 48 h***

and

- ***GC analysis of*** **gas phase**

Series 2:

- ***Coal oxidation Air; 50^0 C; 48 h***

and

- **GC analysis of gas phase over oxidized coals**

Links

Between hydrogen and methane emissions

Sample / air contact enhances methane desorption from coal fines

Examples:	**Sample**	**A**	**B**	**C**
		Methane % vol		
Before air contact		0.7	1.8	1.2
After air contact		2.4	3.1	7.1

Some hydrogen properties

- **Hydrogen is**

14-fold lighter than nitrogen
16-fold " " oxygen
8-fold " " methane

The gas tends to accumulate in upper parts due to fast upward diffusion

- **Fire / expl. limit of hydrogen: 4 % in air**
  " / " " methane: 5 " " "

Hydrogen in ventillation air streams

enters atmosphere and contributes to:

- **Ozon layer depletion**
- **Water vapour (GHG !) concentration increase**
- **Complex interaction with some other GHG**

It results in climate warming

Hydrogen potential impact on climate cannot be assessed as yet
Amounts of releases from all coal mines have been unknown

Conclusions-Safety means-Questions

- Continous removal of coal fines from mine galleries
- What about mine goafs?
- Studies on utilization of methane & hydrogen occuring in ventillation air streams ?
- Studies on utilization of hydrogen & methane generated in piles of coal fines during their surface storage ?