ECN

Energy research Centre of the Netherlands

TU Delft

Delft University of Technology

Greenhouse gases from peat areas

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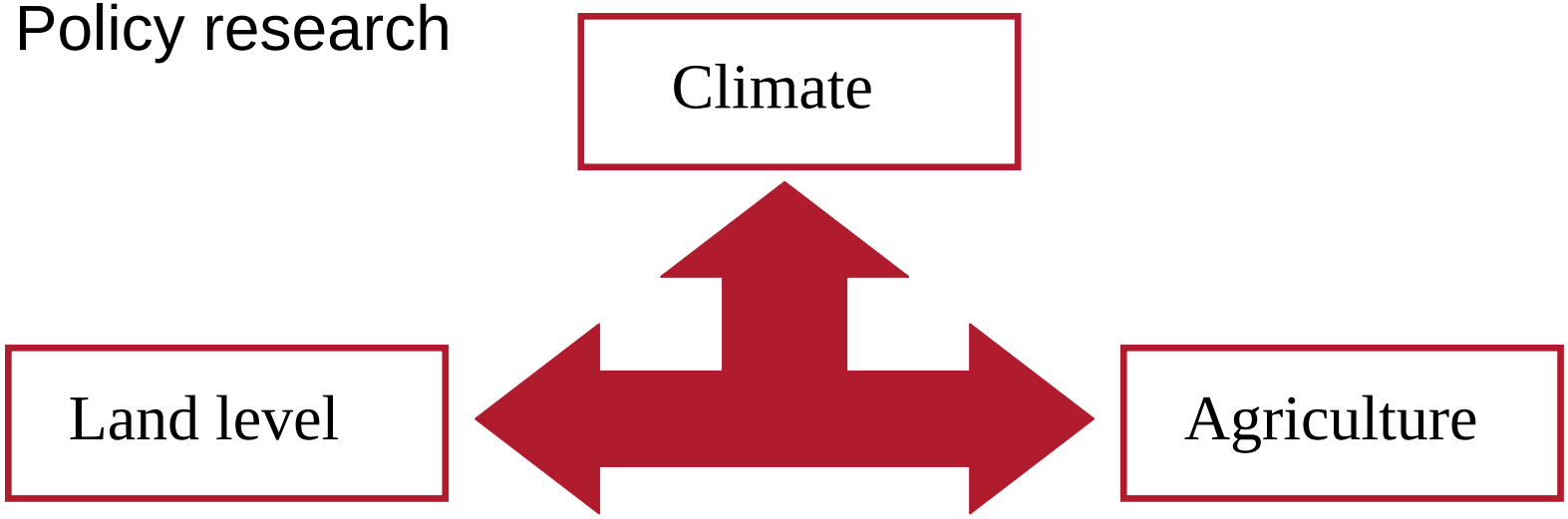
Outline

- Background
- Objectives
- Actual research method
- First results
- Additional airplane measurements

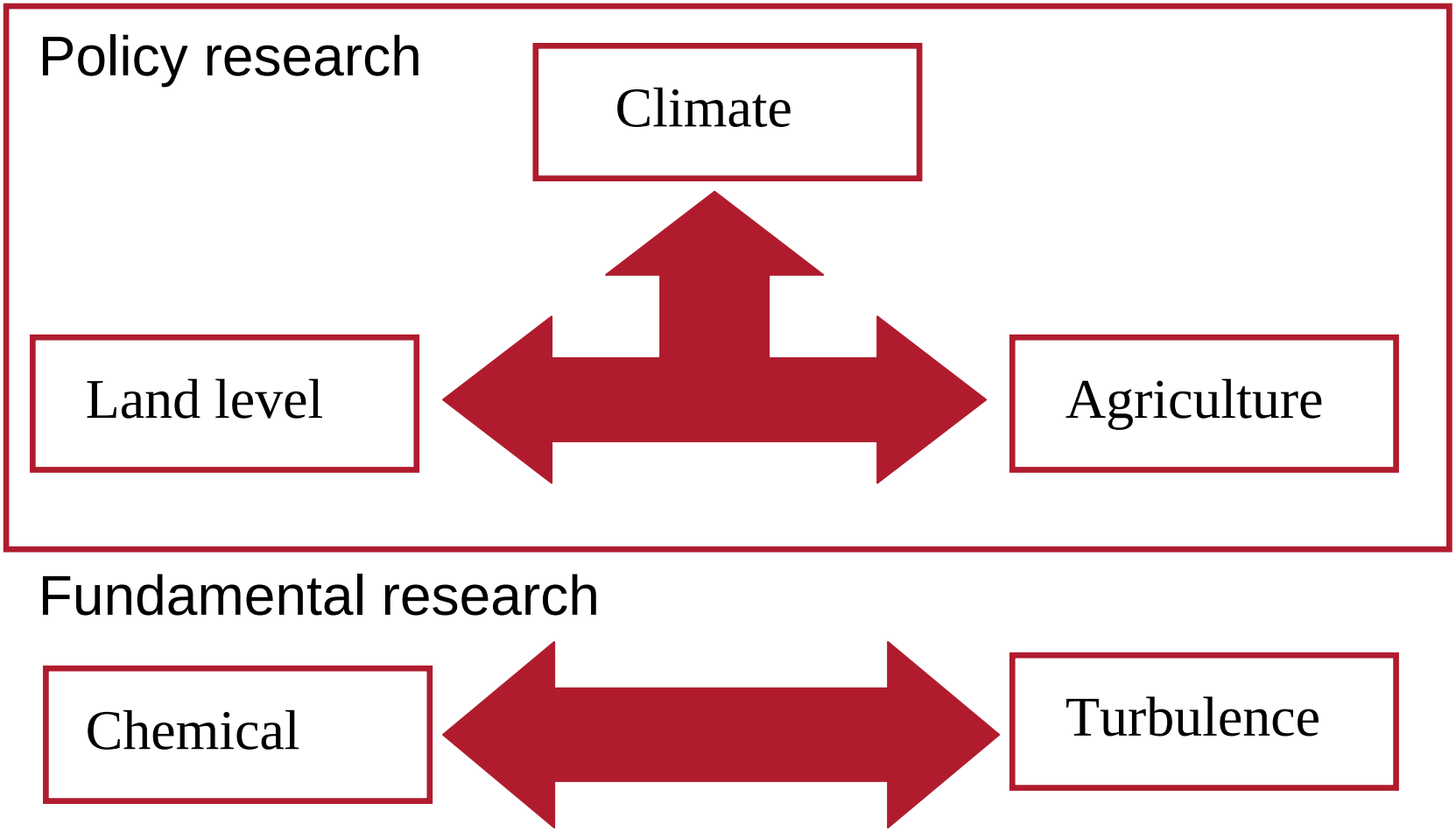
Background

Policy research



Fundamental research

Background


Policy research
Climate
Land level
Agriculture
Fundamental research
Chemical
Turbulence

Background: Land-use change on peat land

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Land surface in 1848

CO_2 to atmosphere

↑

Oxidation of peat

Drainage caused oxidation and thus dramatic land subsidence in East England

Land surface in 2000

Background: Land-use change on peat land

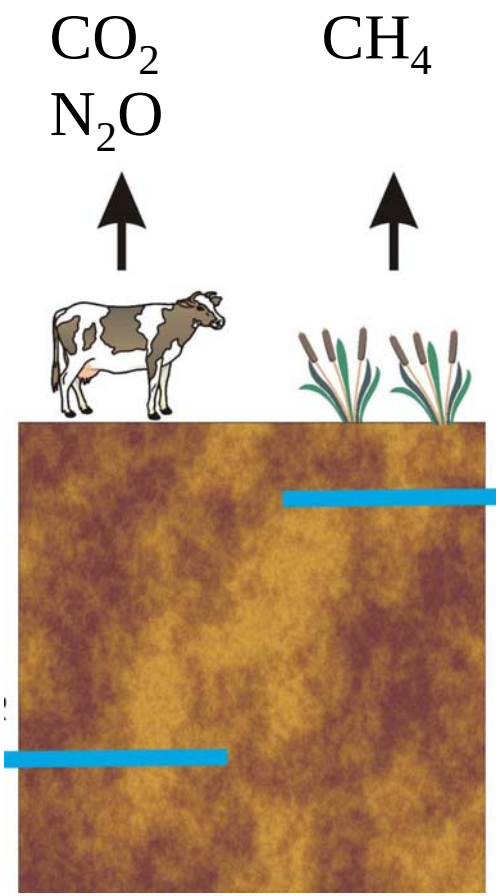
Agriculture:

CO_2 from peat decomposition

N_2O from manure

Stronger greenhouse effect

Soil subsidence and rising sea level



Nature/wetland:

High water level

Wetland restoration:

Fixing CO_2 in new peat

More CH_4

Less agriculture

Agriculture:

Low water level

Objectives

1. To determine the greenhouse gas emissions of CH_4 and N_2O from a mainly agriculture used peat area

2. To determine the effect of water management on the greenhouse gas emissions of CH_4 and N_2O from a managed peat site

3. To investigate the distribution by turbulence and the chemical properties of the greenhouse gases CH_4 and N_2O

Actual research method

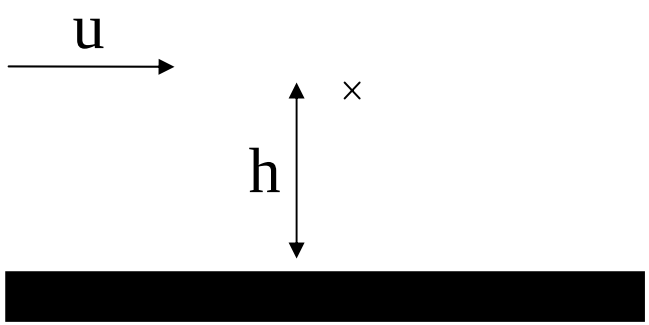
Oukoop

Cabauw

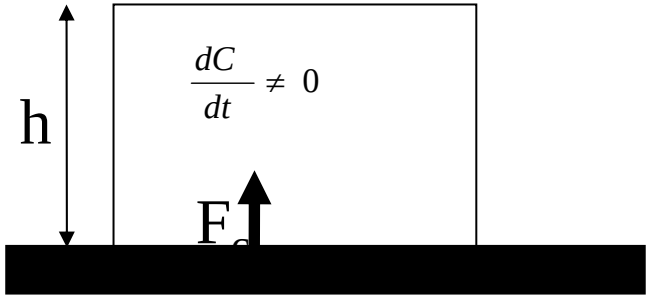
Actual research method

Oukoop

Eddy covariance measurements



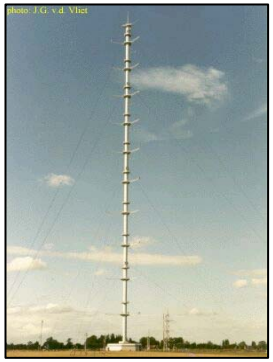
Fast chamber measurements



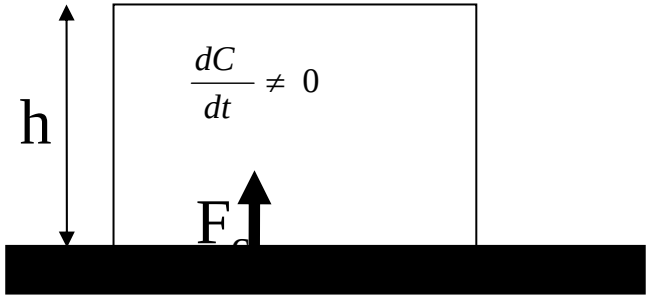
Actual research method

Cabauw

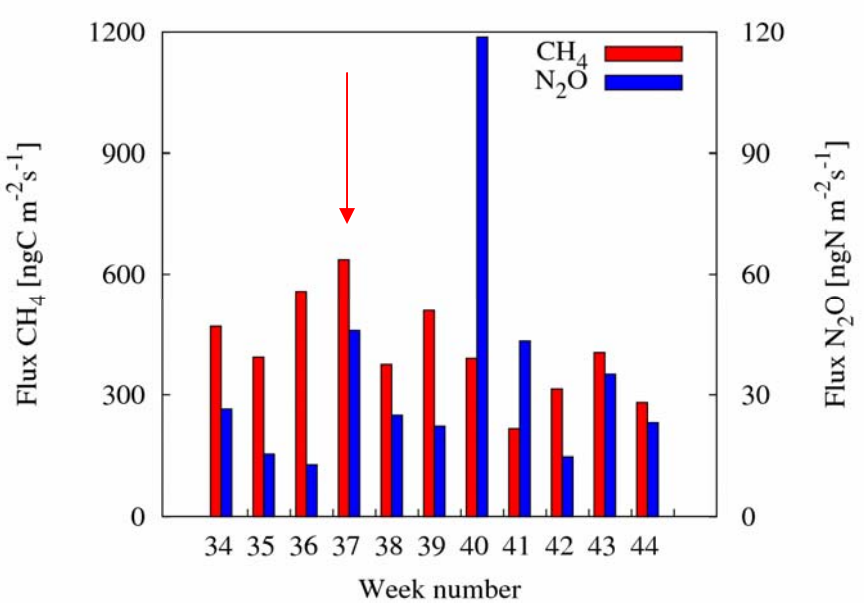
Profile concentration measurements



Automatic chamber measurements

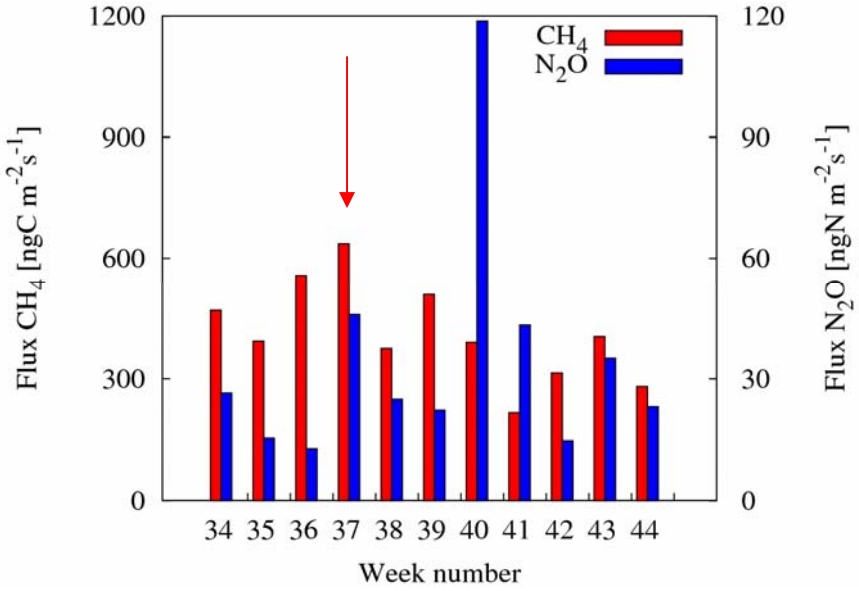


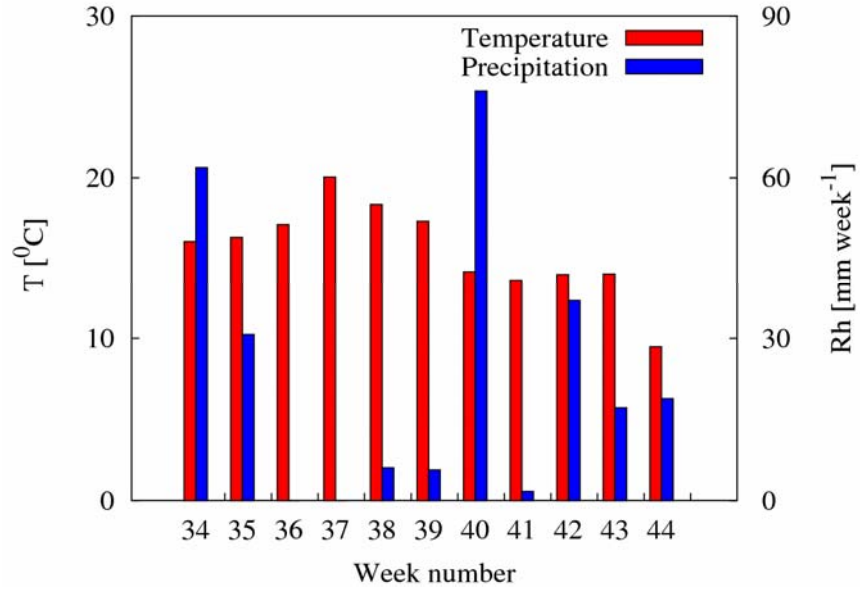
Results: Oukoop EC-measurements



- Cow manure application in week 37 of 55 $kgNha^{-1}$

Results: Oukoop EC-measurements





- Cow manure application in week 37 of 55 $kgNha^{-1}$
- Highest CH_4 peak in week 37
- Highest N_2O peak in week 40 (related to precipitation)

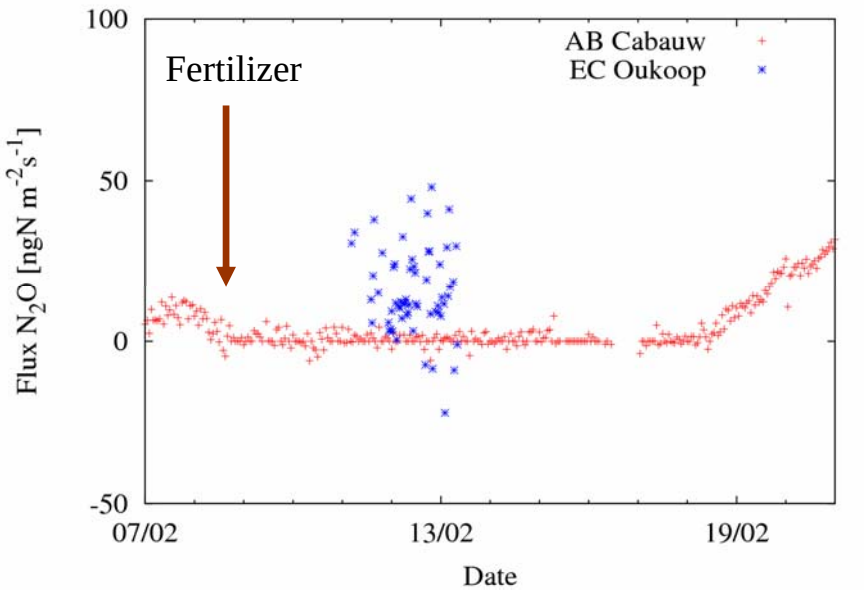
Results: Oukoop EC-measurements

- About 40% of the total N_2O emission was due to a fertilizing event
- About 5% of fertilized N is emitted (55 $kgNha^{-1}$ applied)
- N_2O and CH_4emission of 1.5 and 1.0 ton CO_2 equivalents per hectare over August to November 2006

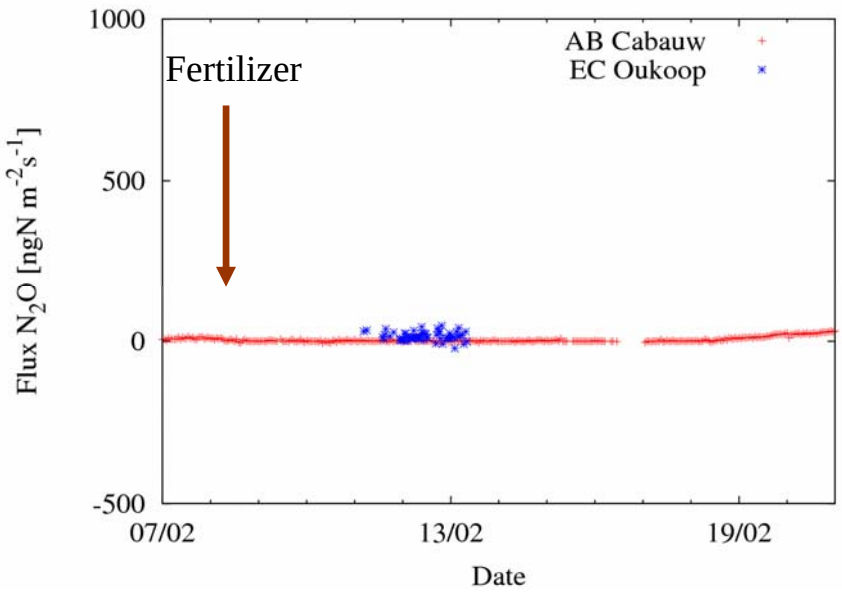
→ Assuming a dairy farm of 25 hectare:

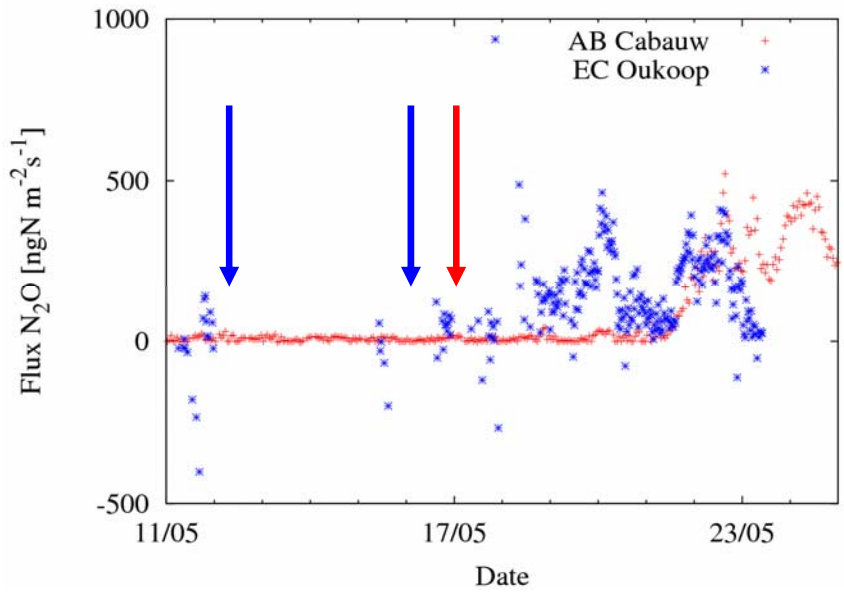
This CO_2 emission is equal to 420.000 km by petrol car

Results: Cabauw versus Oukoop



Results: Cabauw versus Oukoop





- Magnitude of flux dependent on meteorological circumstances
- Magnitude of flux dependent on amount of applied fertilizer
- Magnitude of flux is approximately the same for both grassland sites

Results: Fundamental research

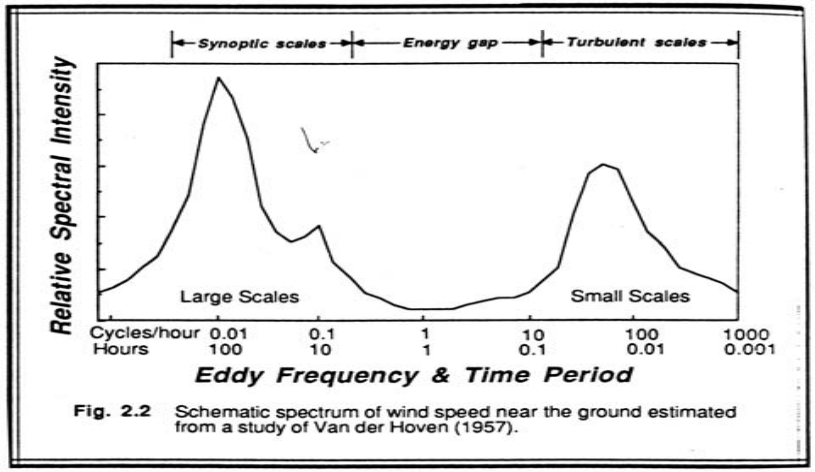
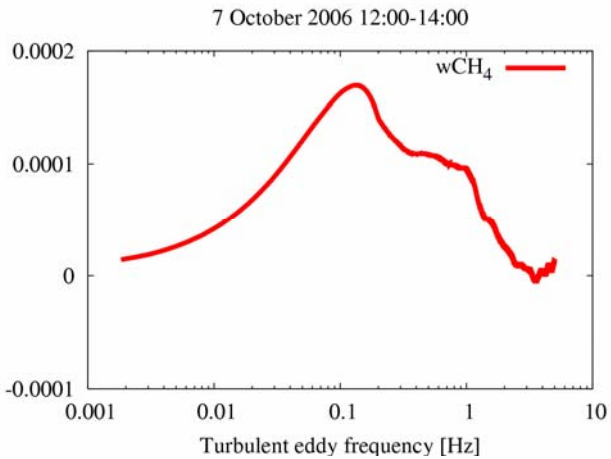
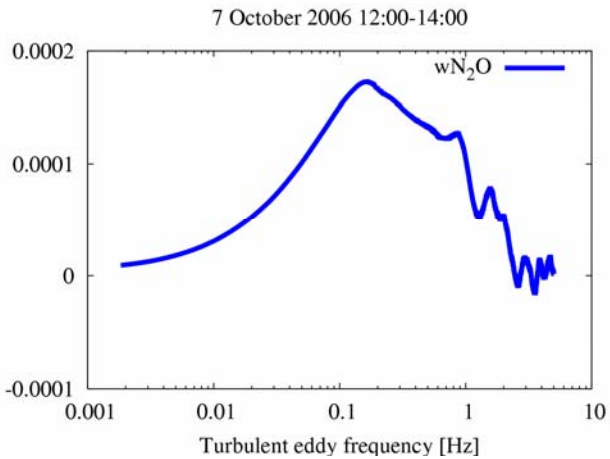


Fig. 2.2 Schematic spectrum of wind speed near the ground estimated from a study of Van der Hoven (1957).





Why need for additional airplane measurements?

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