



The Abdus Salam
International Centre for Theoretical Physics



2256-17

**Workshop on Aerosol Impact in the Environment: from Air Pollution to
Climate Change**

8 - 12 August 2011

**Numerical simulation of the interaction between stratocumulus clouds and the aerosol
particles**

B. Szabo Takacs
*University of Pecs, Pecs
Hungary*

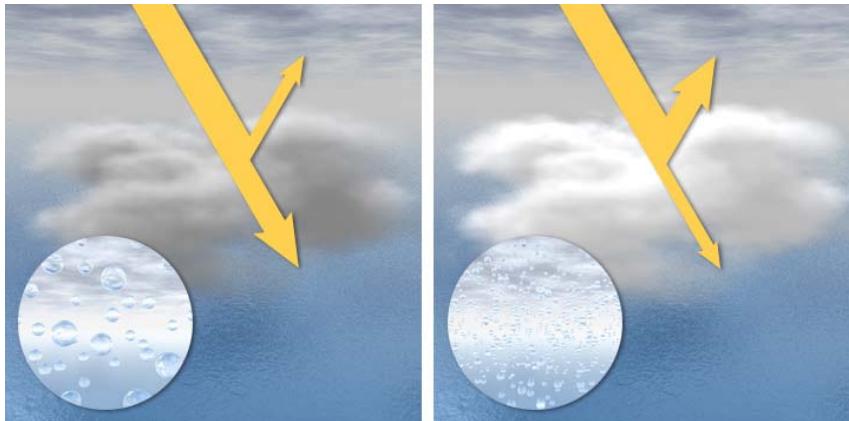
Workshop on Aerosol Impact in the Environment:
From Air Pollution to Climate Change, Triest 2011

Numerical simulation of the interaction between stratoumulus clouds and aerosol particles

Szabó-Takács Beáta
University of Pécs



Introduction

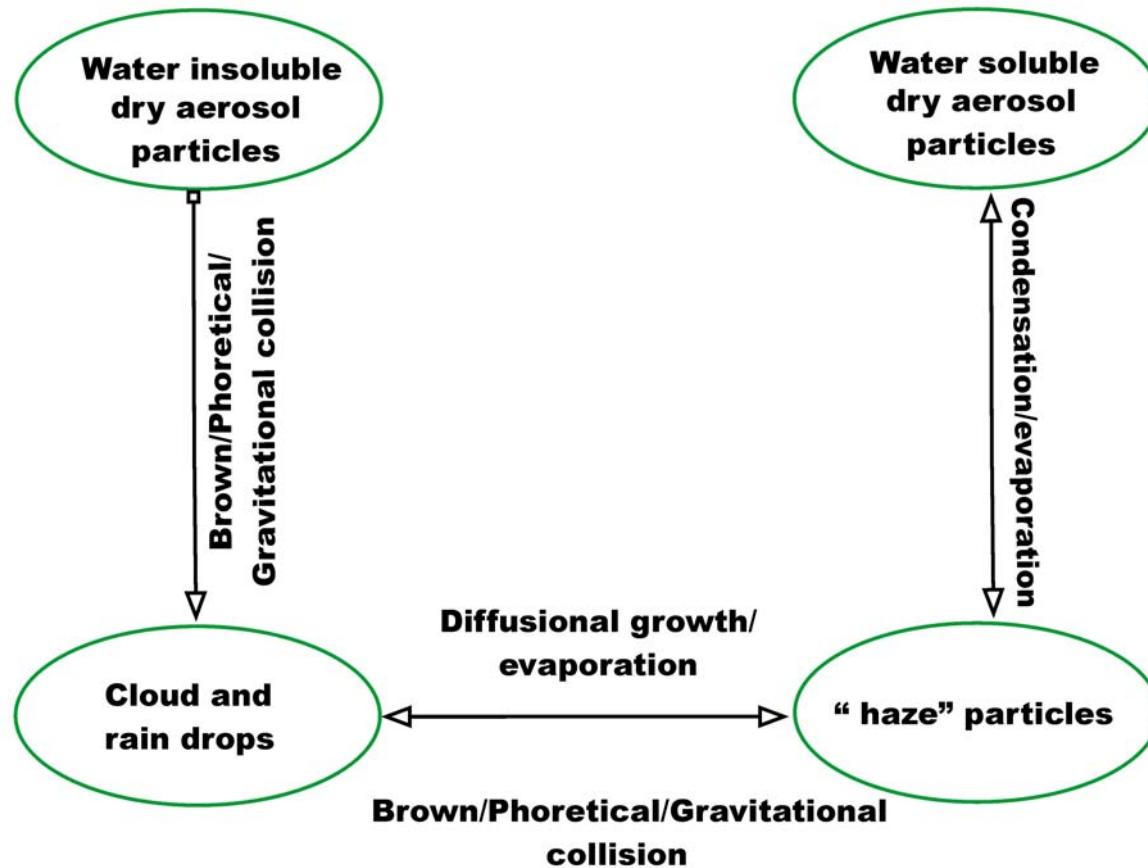


- <http://earthobservatory.nasa.gov>



Model

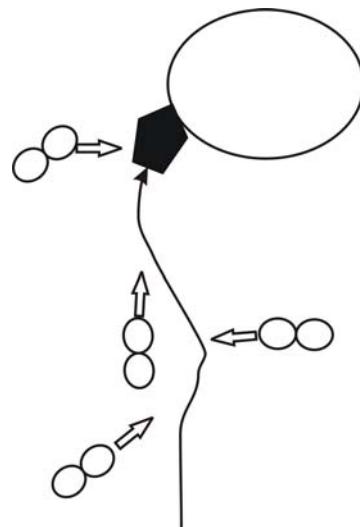
Two-dimensional kinematic model



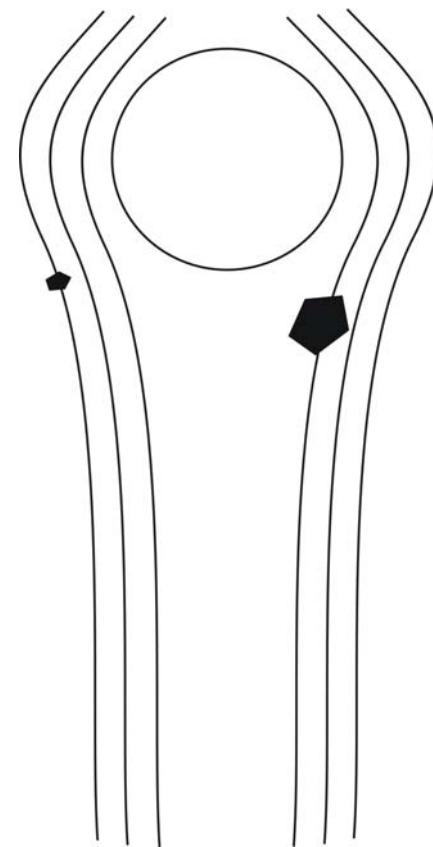
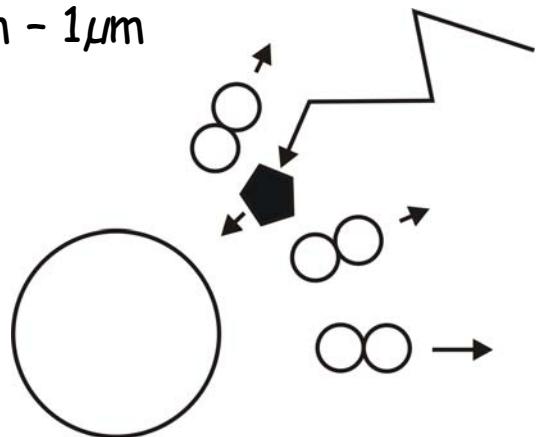
- „haze” particles + water drops + rain drops 55 size interval:
0.0193 „ μm - 5.07 mm
- Aerosol particles 36 size interval: 0.0165 μm - 53.86 μm

Model

Brownian collision
 $0.01 \mu\text{m} - 0.1 \mu\text{m}$

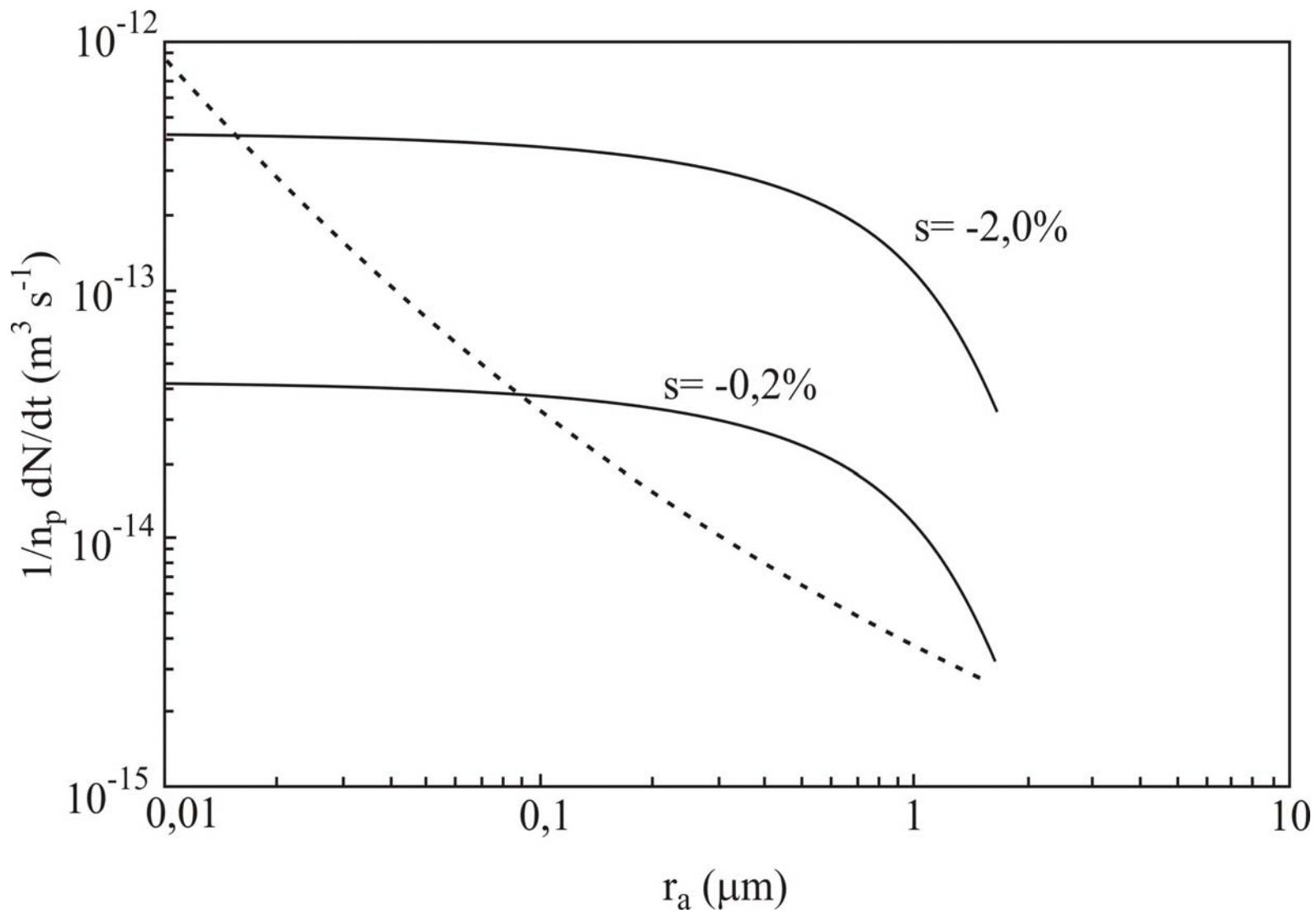


Phoretical
collision
 $0.1 \mu\text{m} - 1 \mu\text{m}$



Gravitational collision
 $> 1 \mu\text{m}$

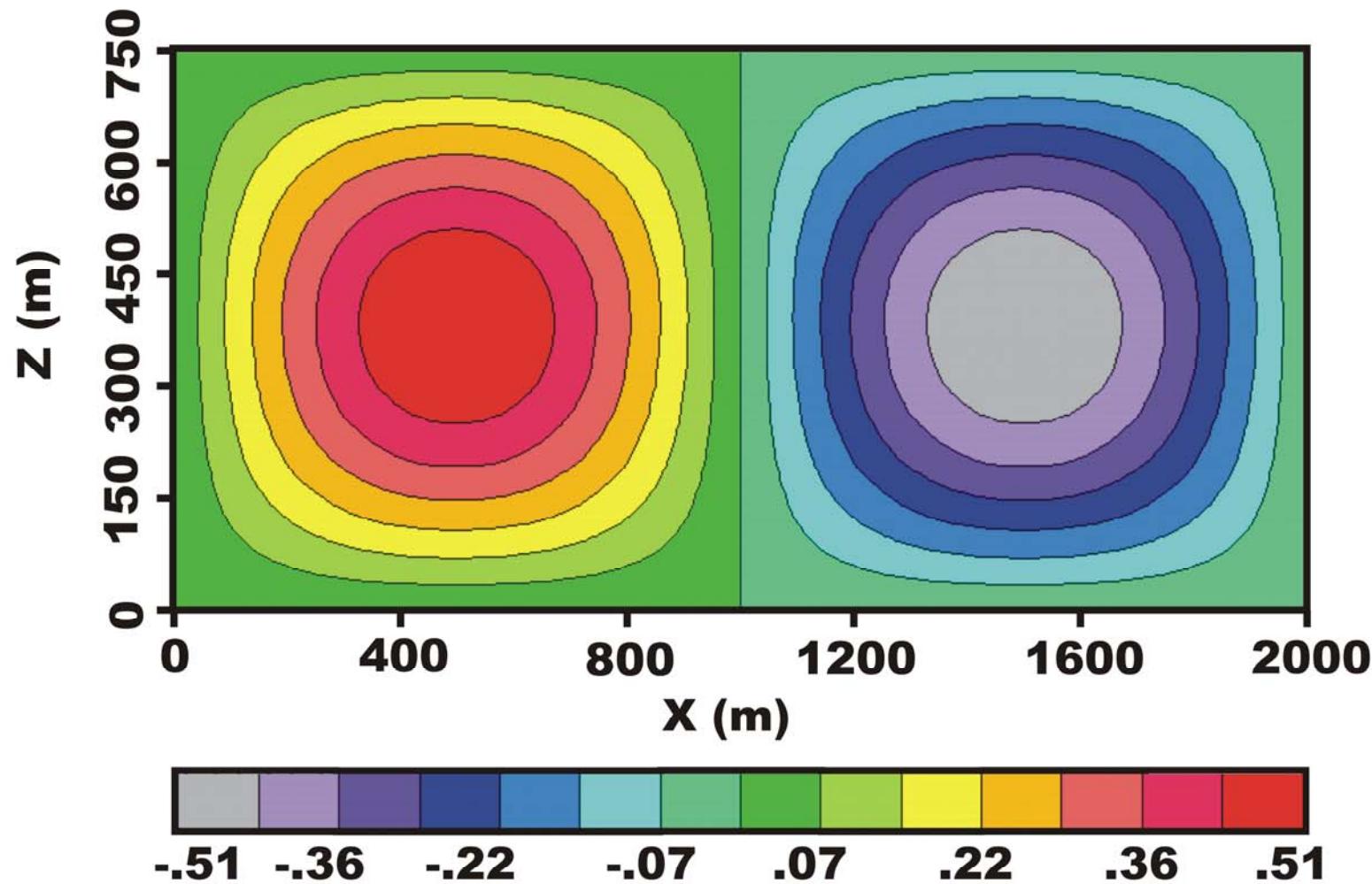
Model



- Geresdi I., 2004

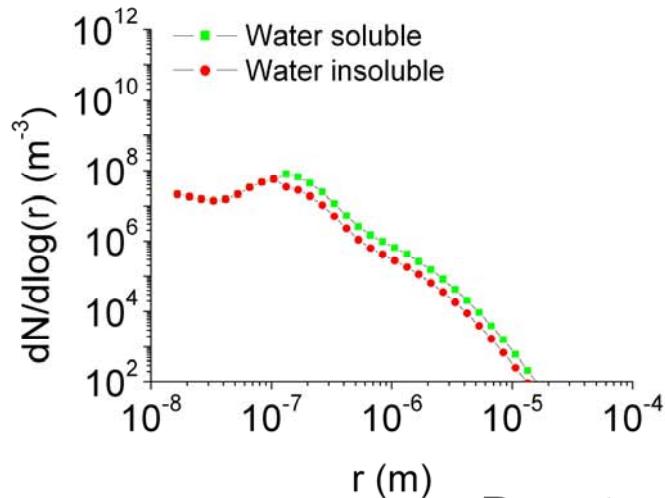
Model

W (m/s)

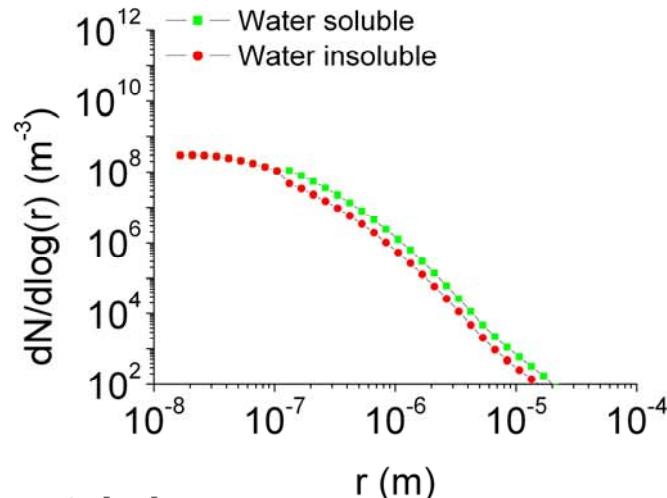


Model

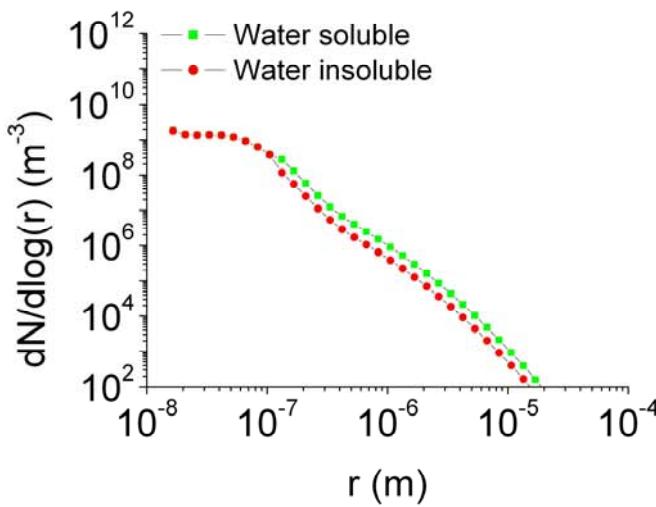
Maritime airmass



Rural airmass

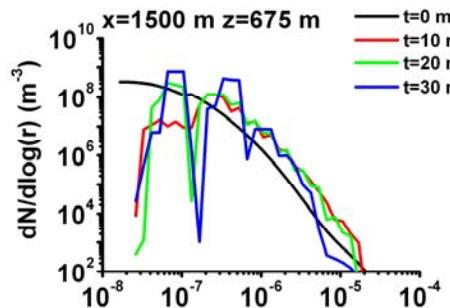


Remote continental airmass

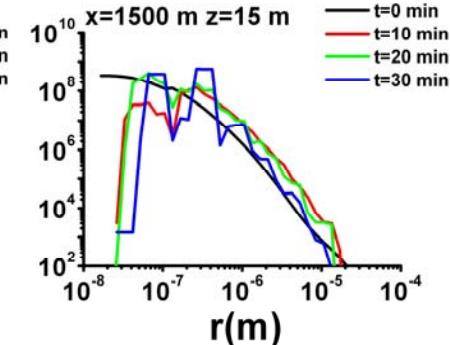
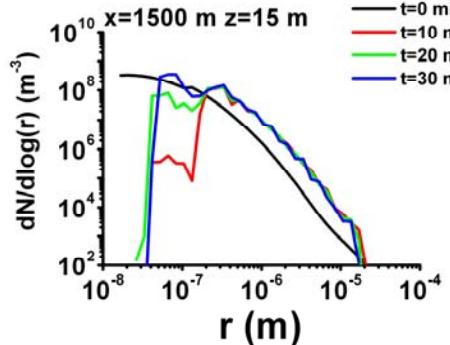
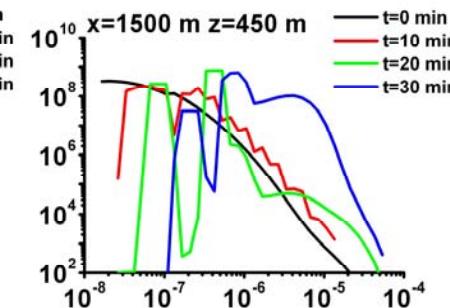
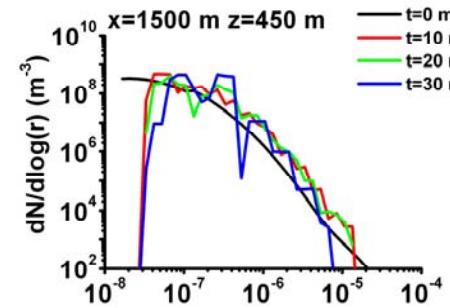
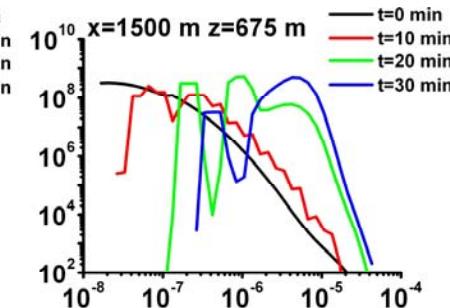


Results

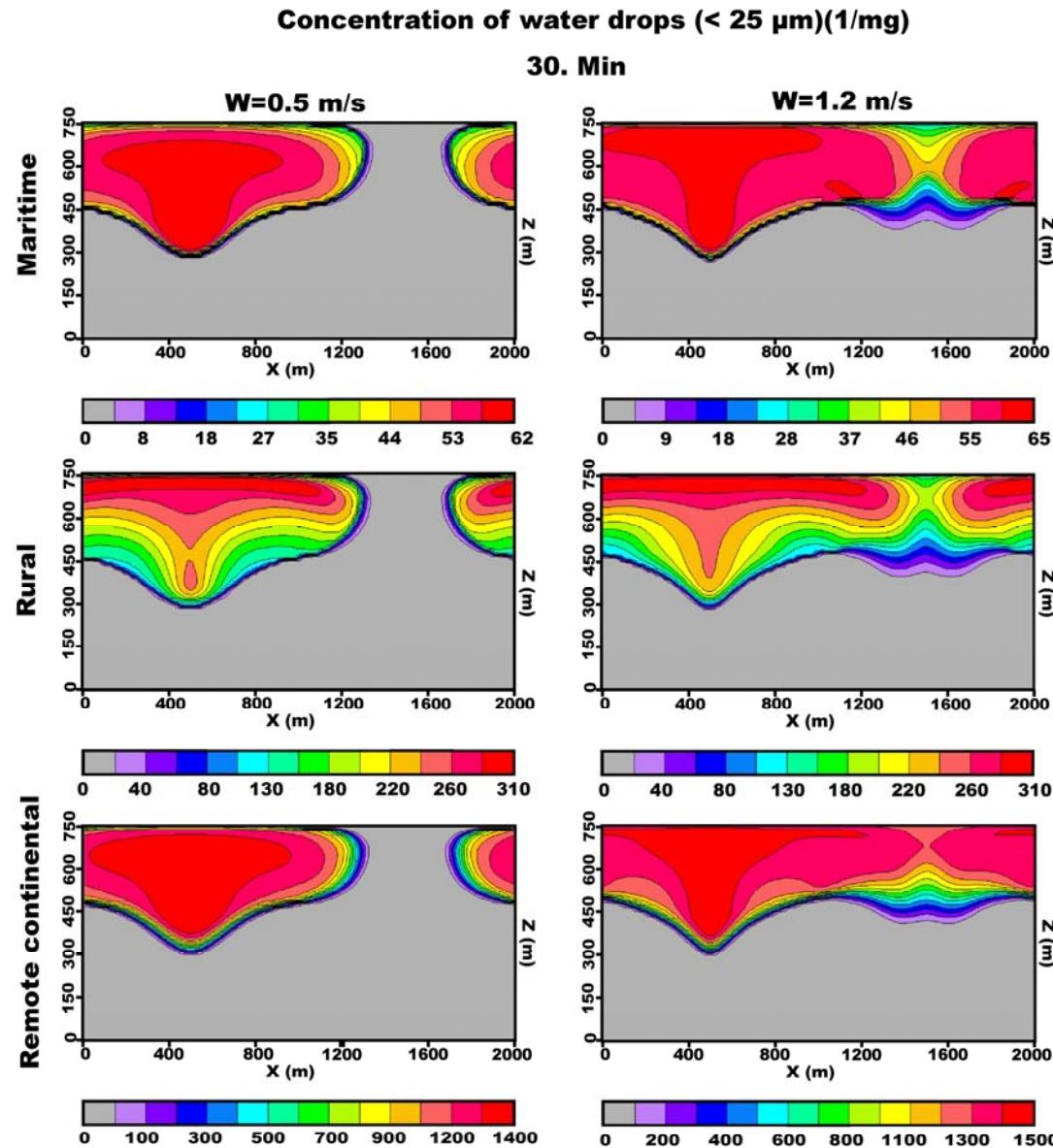
w=0.5 m/s



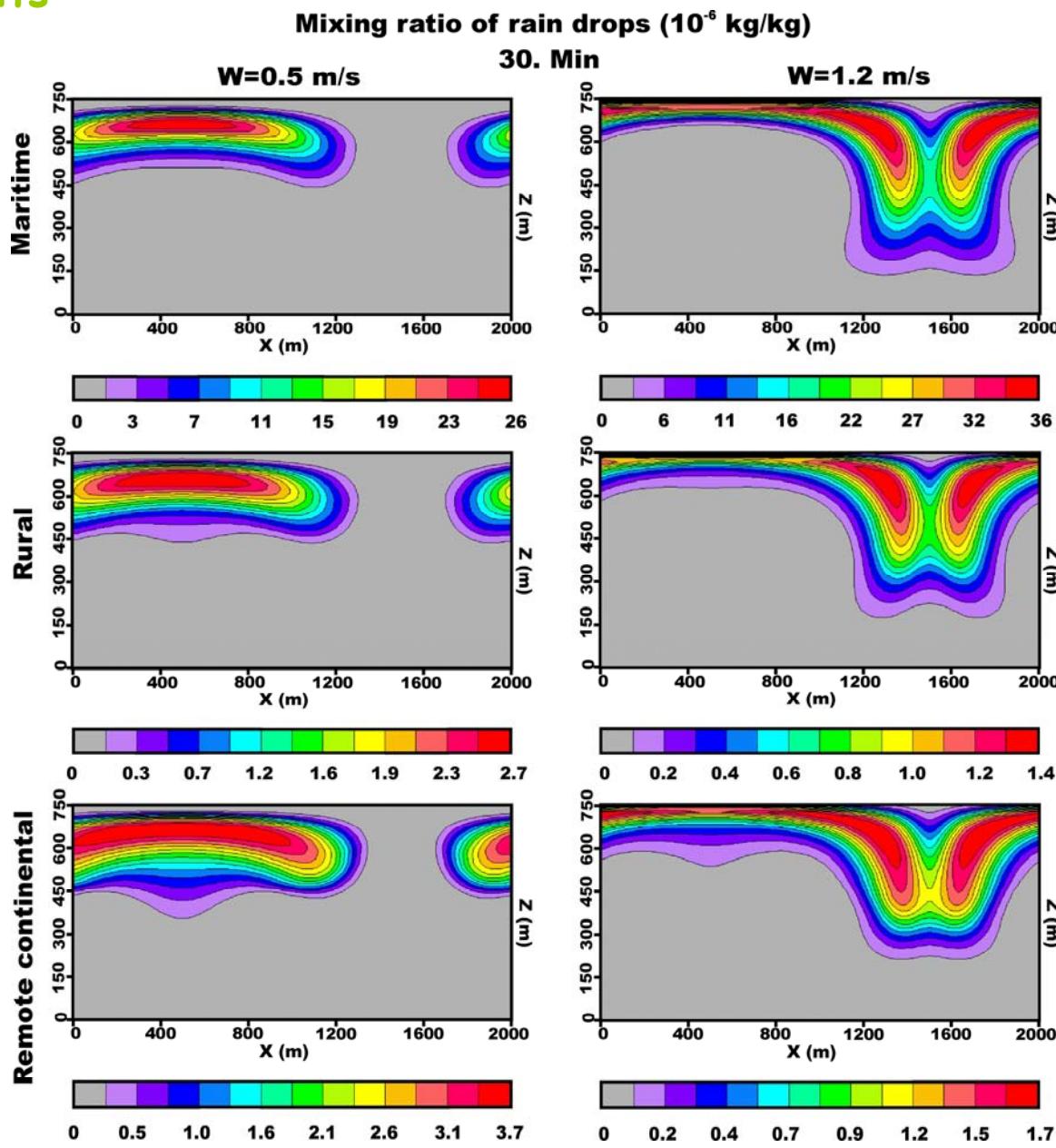
w=1.2 m/s



Results



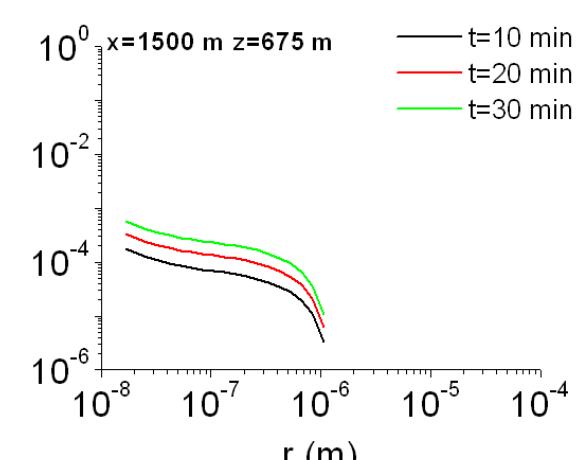
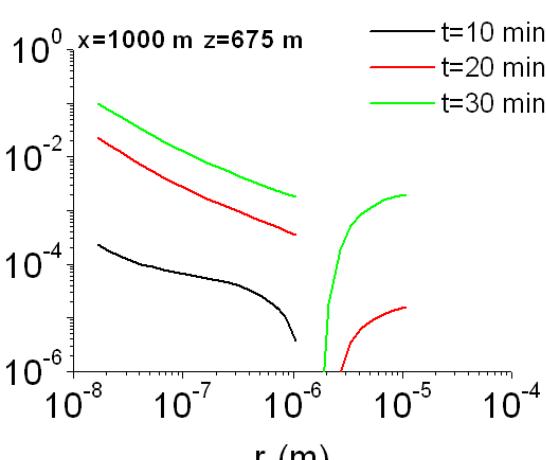
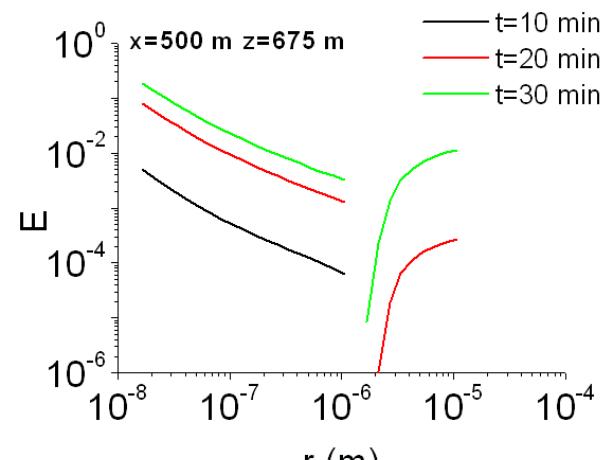
Results



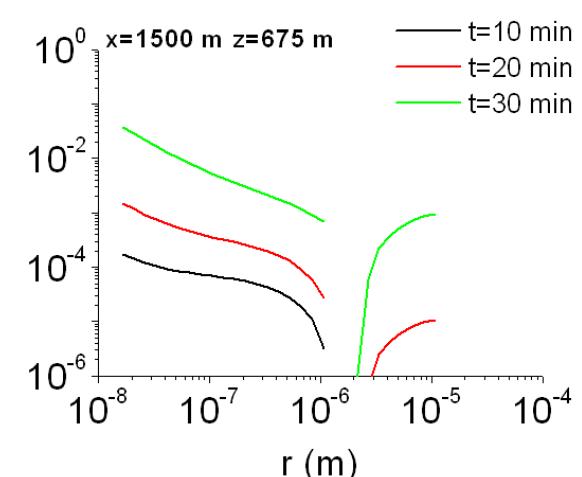
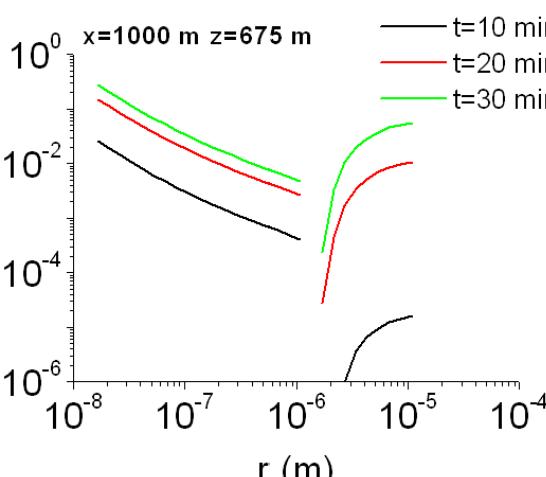
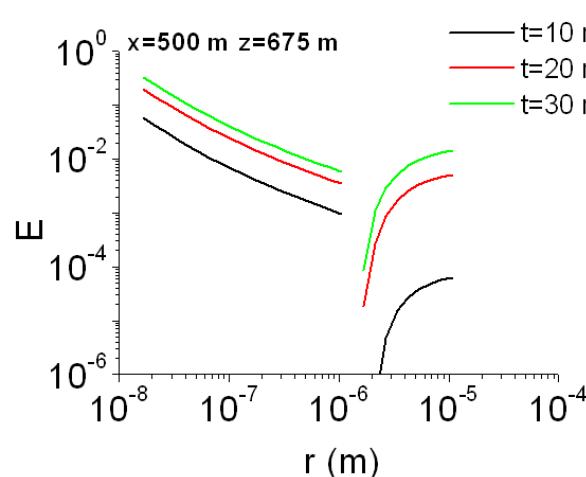
Results

Maritime airmass

w=0.5 m/s



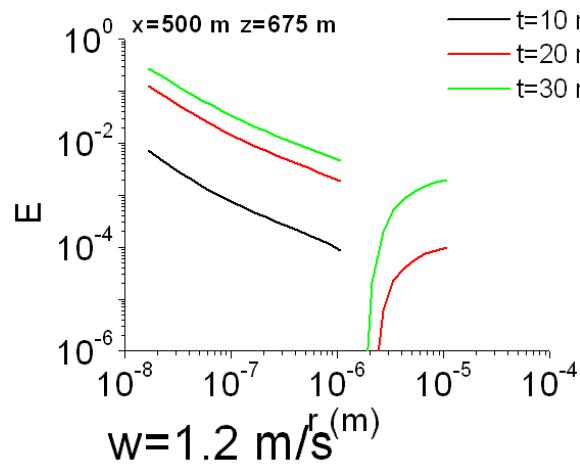
w=1.2 m/s



$$E = \frac{N_0 - \sum_{n=1}^{n_{\max}} p \rho_a \Delta t}{N_0}$$

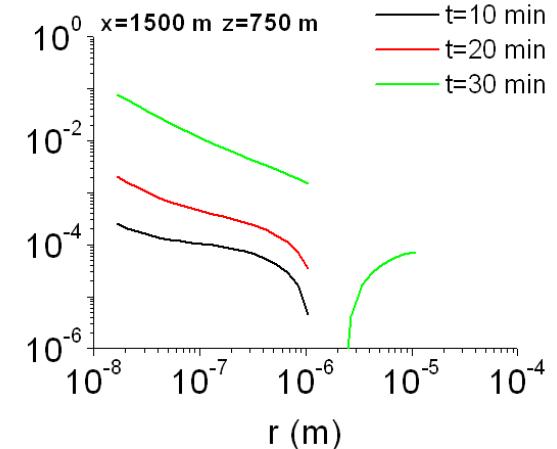
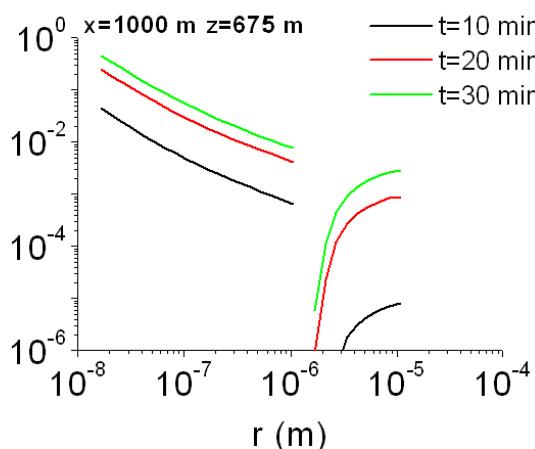
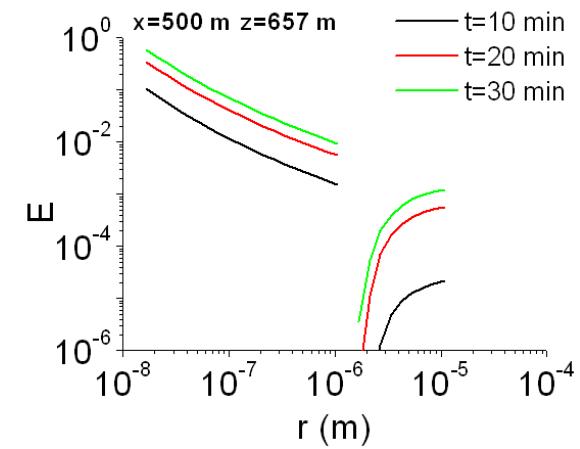
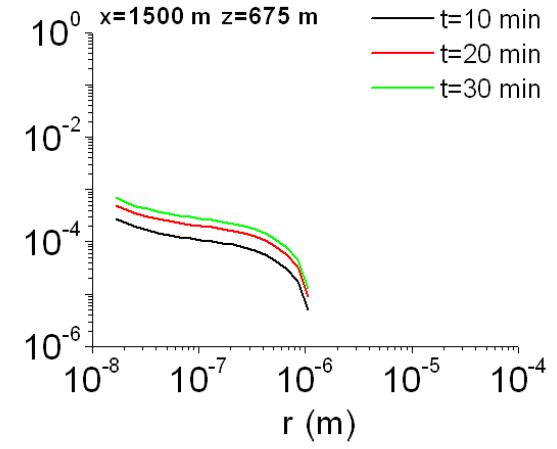
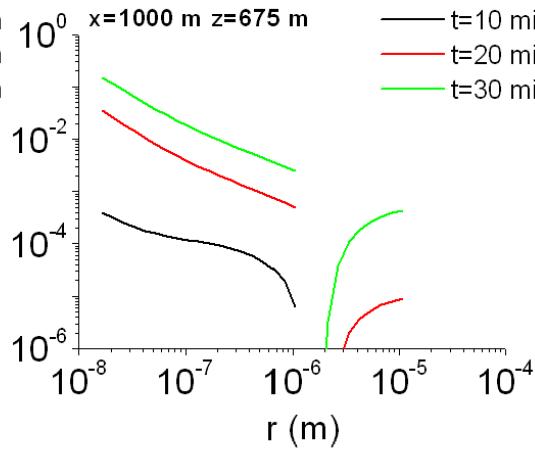
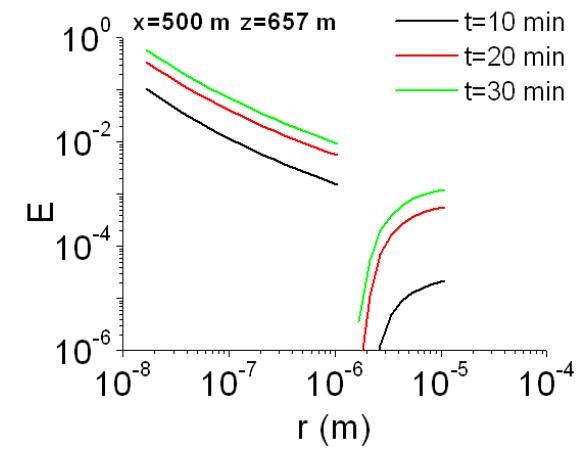
Results

$w=0.5 \text{ m/s}$



Rural airmass

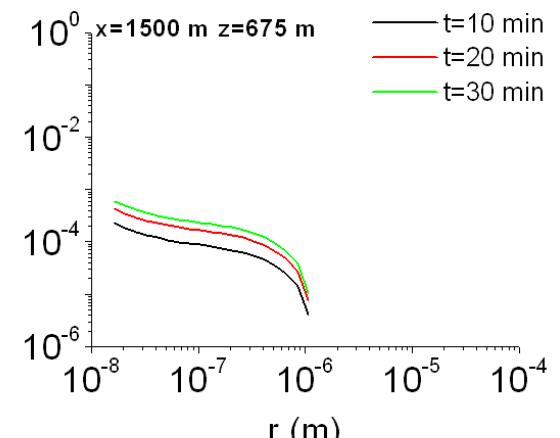
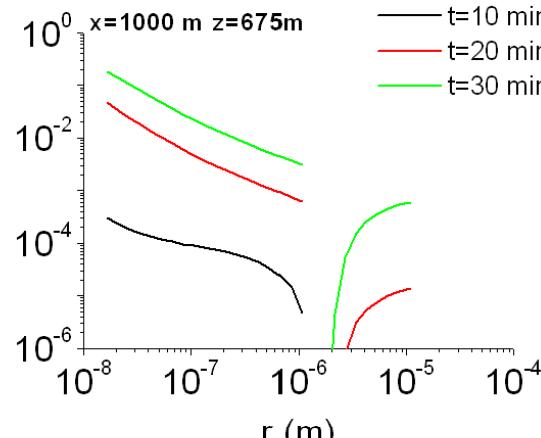
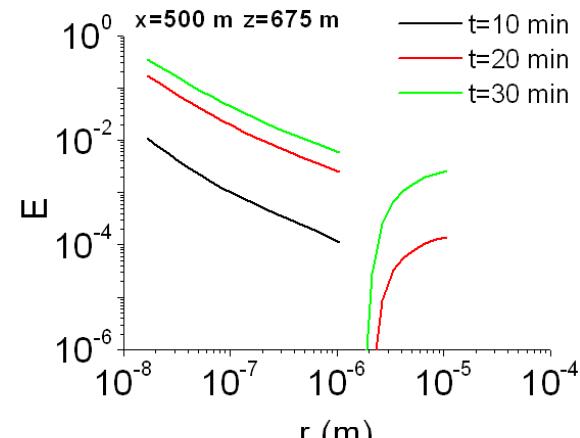
$$E = \frac{N_0 - \sum_{n=1}^{n_{\max}} p \rho_a \Delta t}{N_0}$$



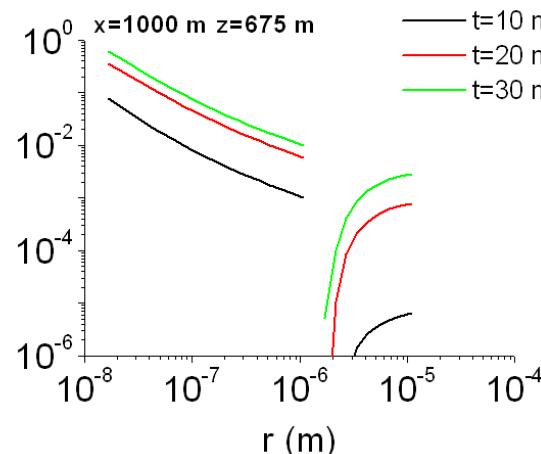
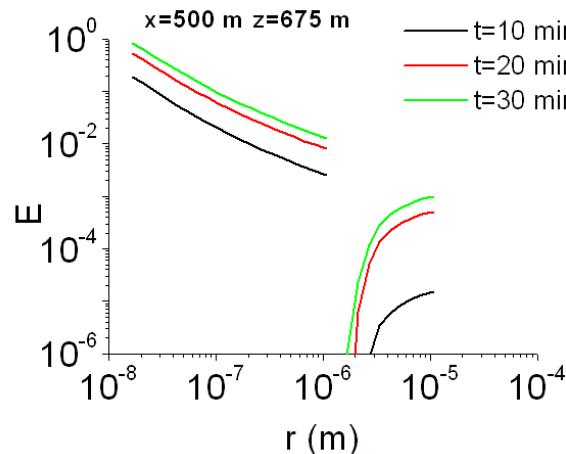
Results

Remote continental airmass

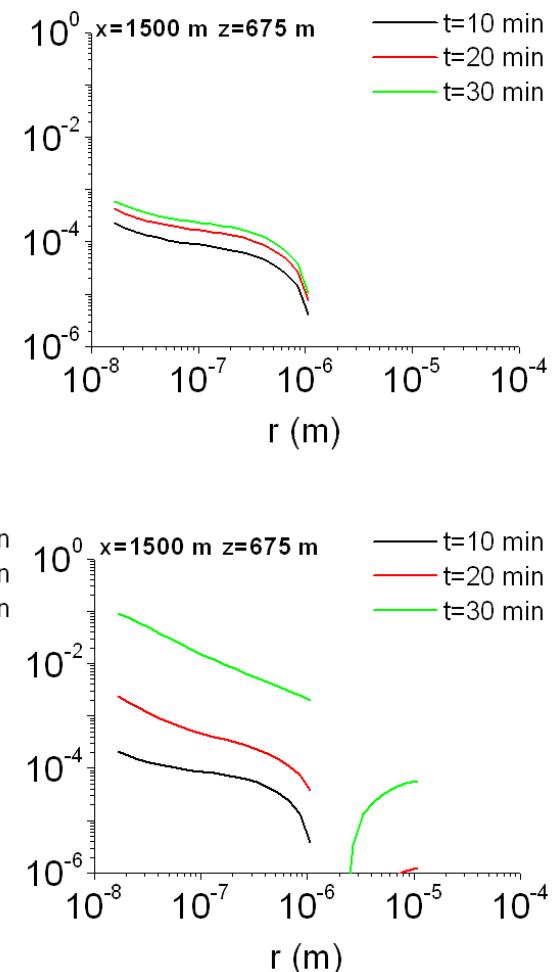
$w=0.5 \text{ m/s}$



$w=1.2 \text{ m/s}$

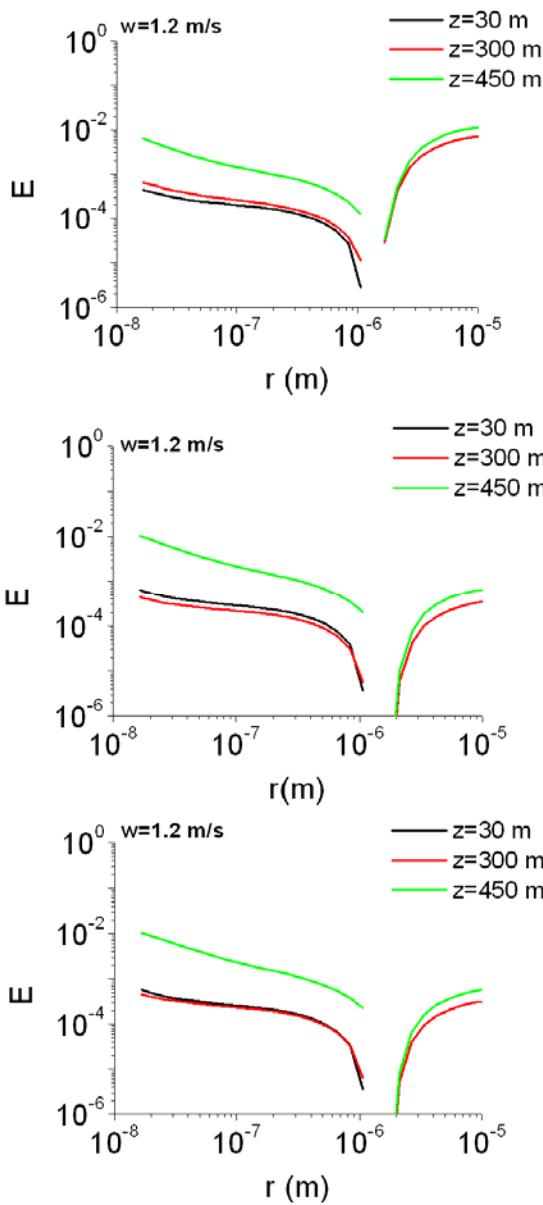


$$E = \frac{N_0 - \sum_{n=1}^{n_{\max}} p \rho_a \Delta t}{N_0}$$



Results

Maritime
Rural
Remote
continental

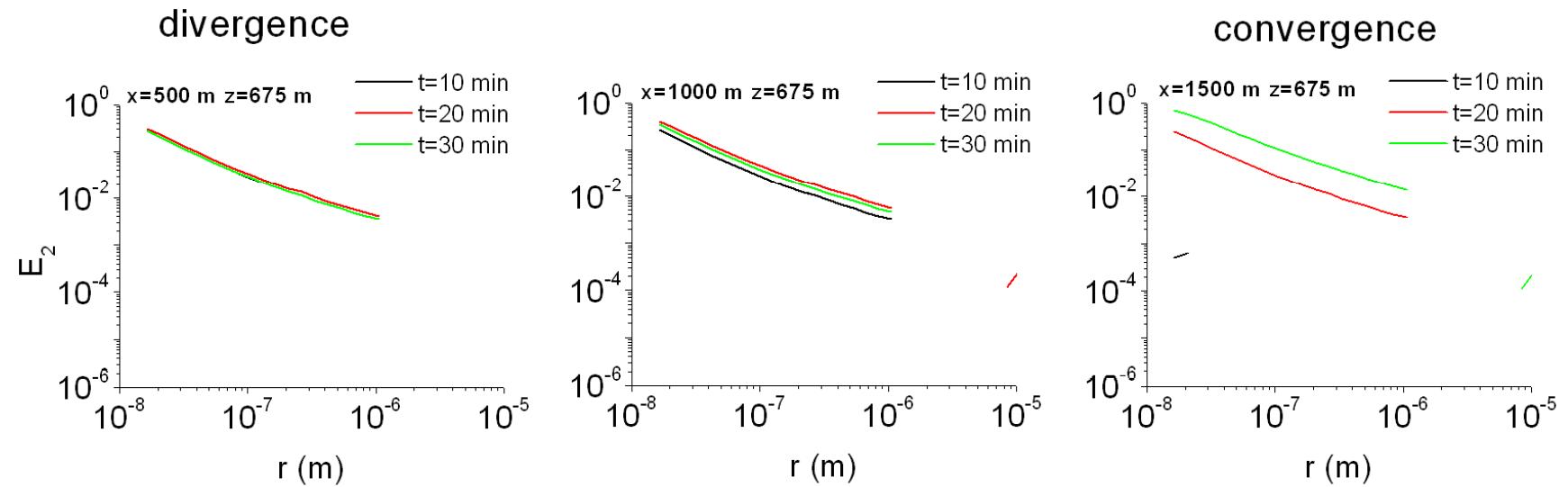


$$E = \frac{N_0 - \sum_{n=1}^{n_{\max}} p \rho_a \Delta t}{N_0}$$

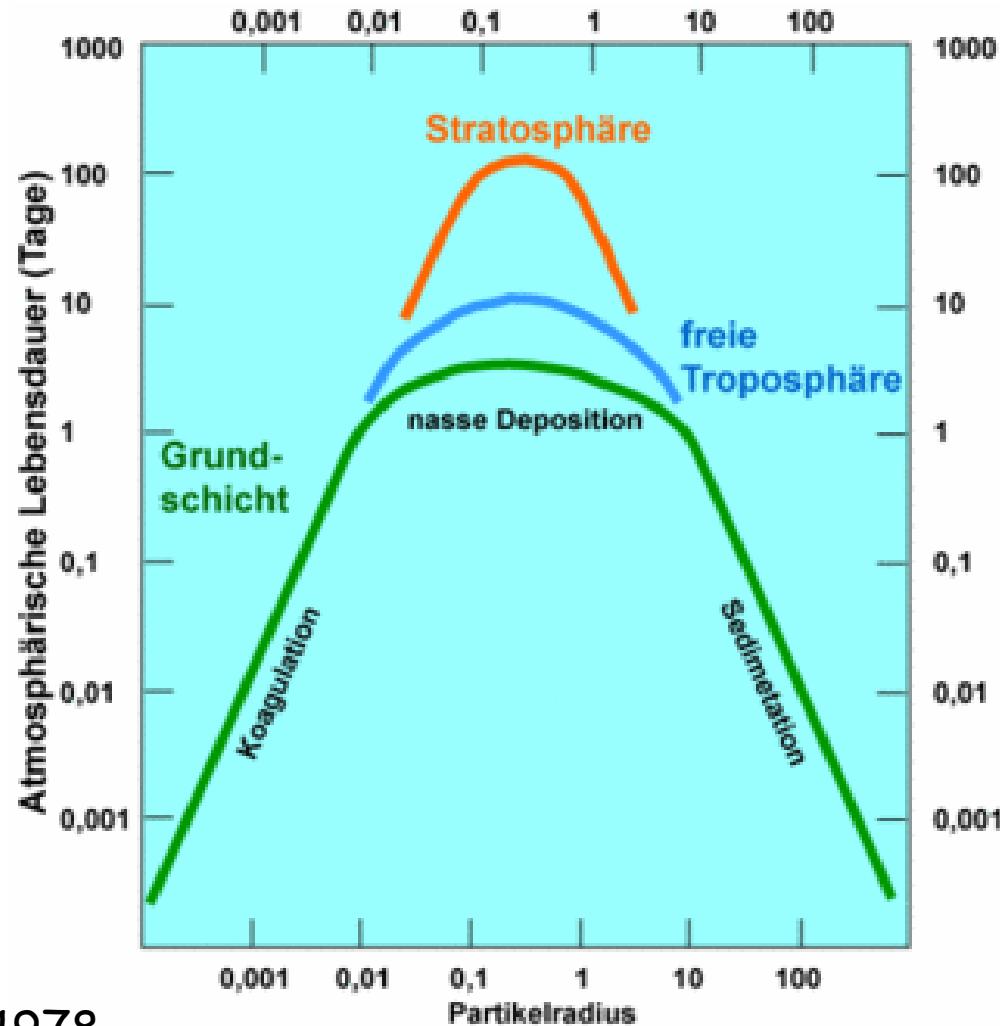
Results

Rural airmass

$$E_2 = \frac{N_0 - N_t}{N_0},$$



Conclusion



Jaenicke, 1978

<http://wiki.bildungsserver.de/klimawandel/index.php/Aerosole>

A landscape photograph featuring a bright blue sky filled with large, white, fluffy cumulus clouds. In the foreground, there are rolling green hills covered in dense vegetation. The overall scene is peaceful and suggests a sunny day.

Thank you!