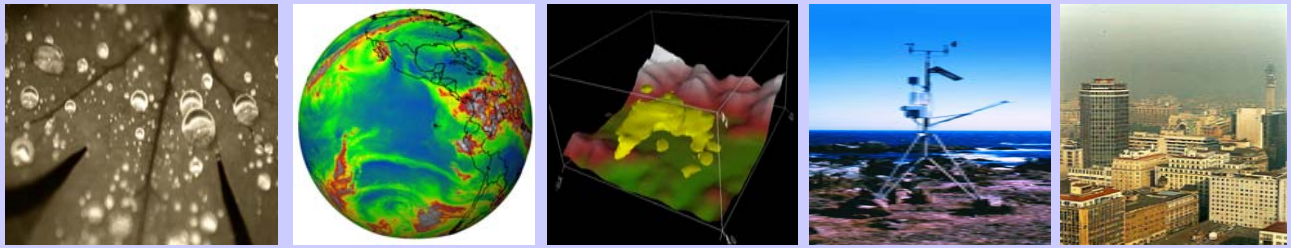


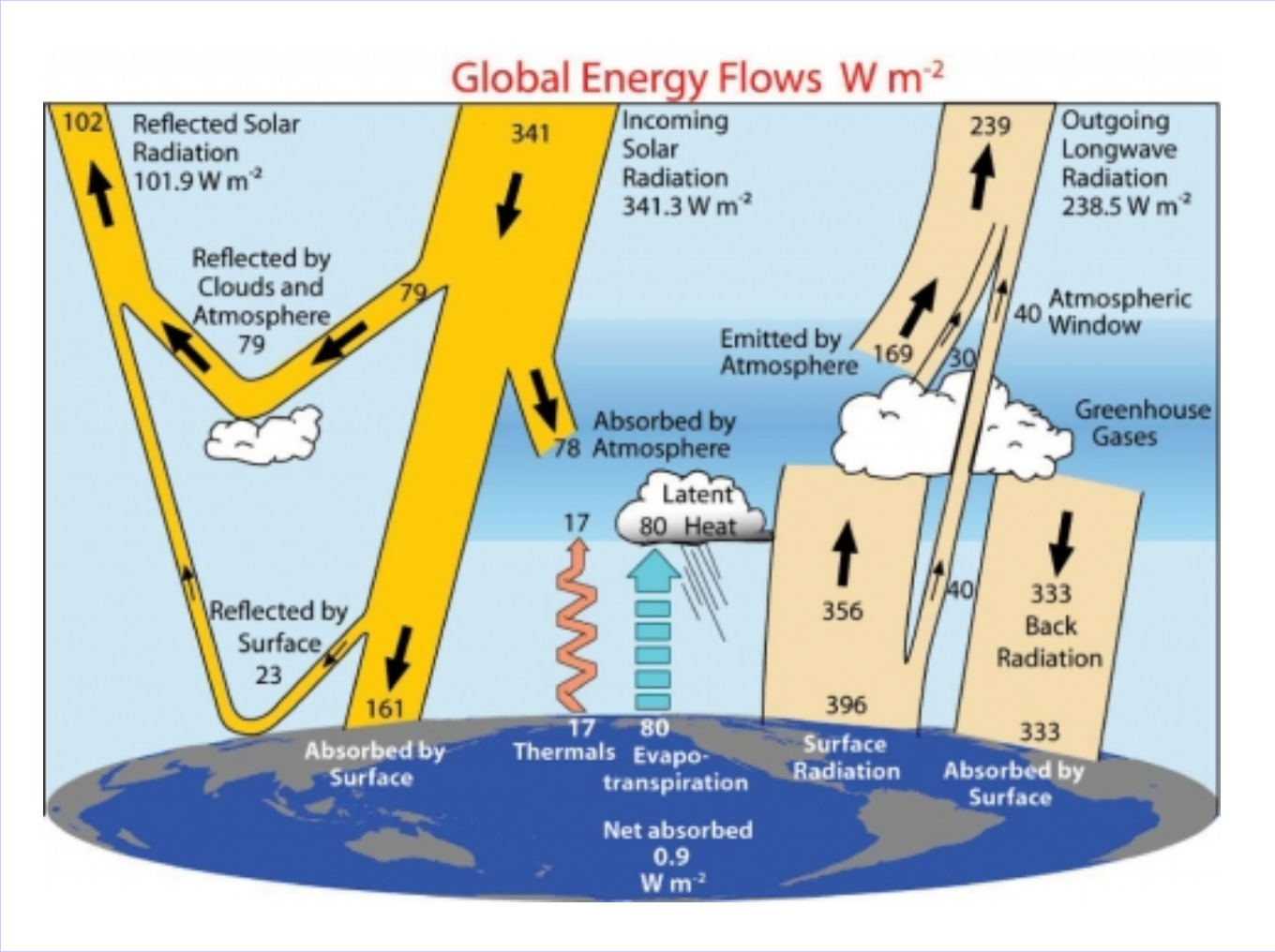
Universidad de Chile
Departamento de Geofísica

GF45A-GF3003
Introducción a la Meteorología y Oceanografía

Semestre Otoño 2009

CLASE 8: Flujos Turbulentos

Prof. René Garreaud
www.dgf.uchile.cl/rene


Global Energy Flows W m-2
102
Reflected Solar Radiation 101.9 W m-2
341
Incoming Solar Radiation 341.3 W m-2
239
Outgoing Longwave Radiation 238.5 W m-2
Reflected by Clouds and Atmosphere 79
79
40 Atmospheric Window
Emitted by Atmosphere
169
30
Greenhouse Gases
Absorbed by 78 Atmosphere
Latent 80 Heat
17
Reflected by Surface 23
356
40
333 Back Radiation
161
396
333
17 Thermals
80 Evapo-transpiration
Absorbed by Surface
Surface Radiation
Absorbed by Surface
Net absorbed 0.9 W m-2

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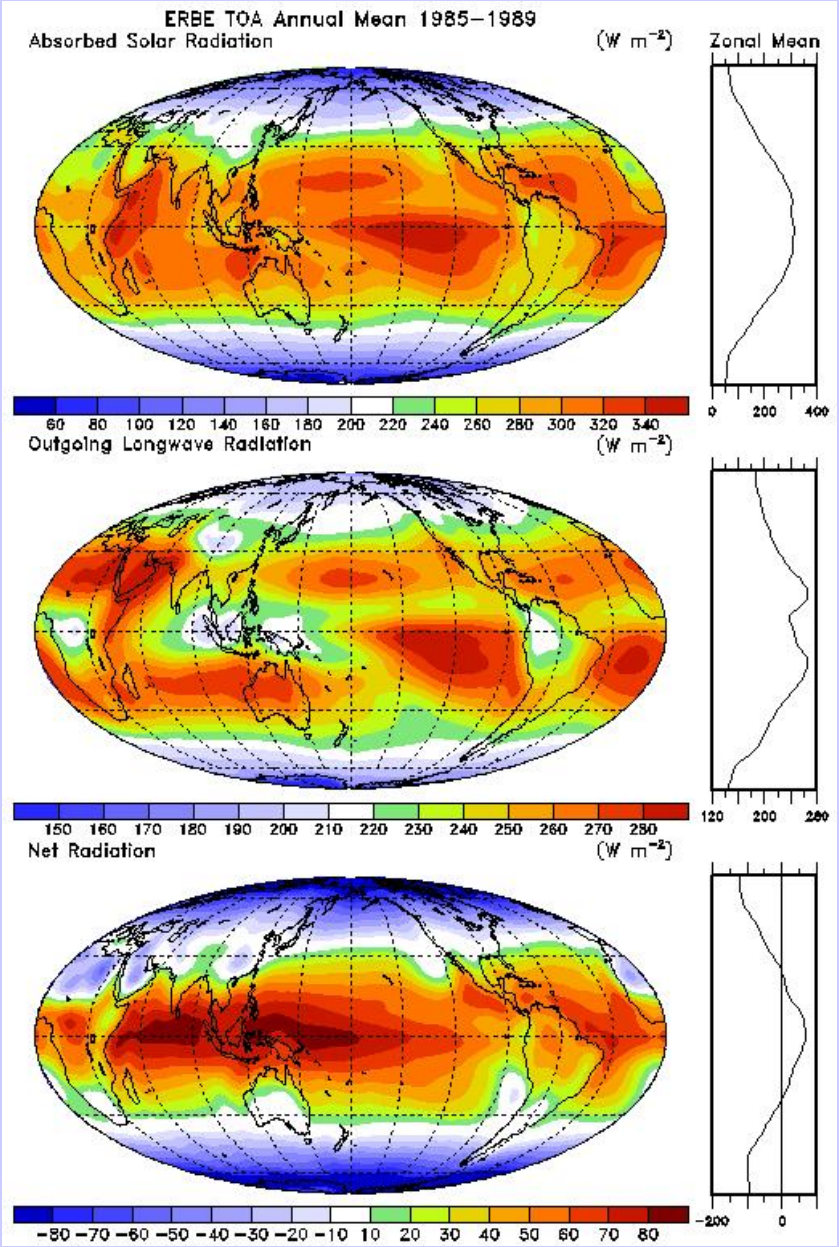

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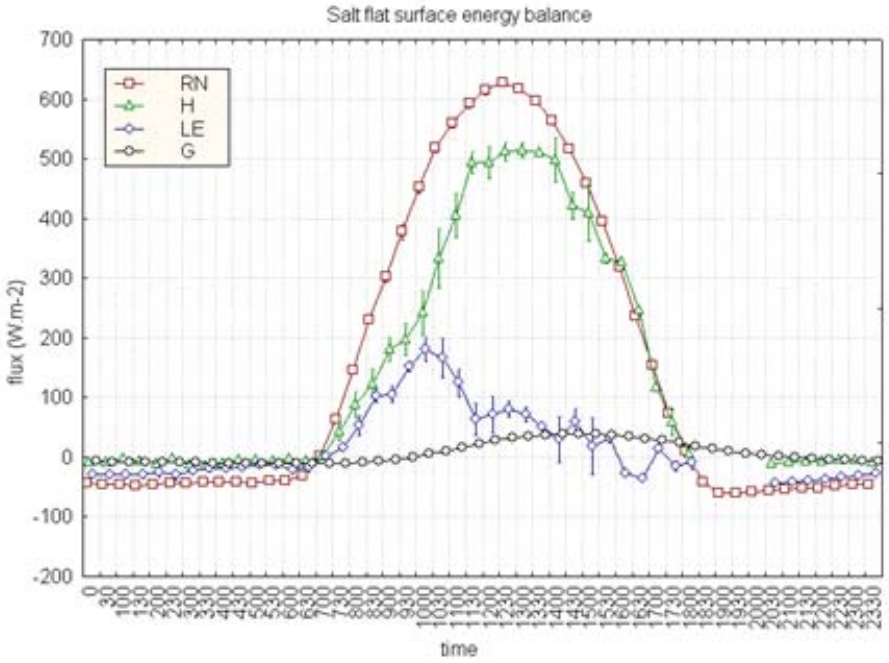
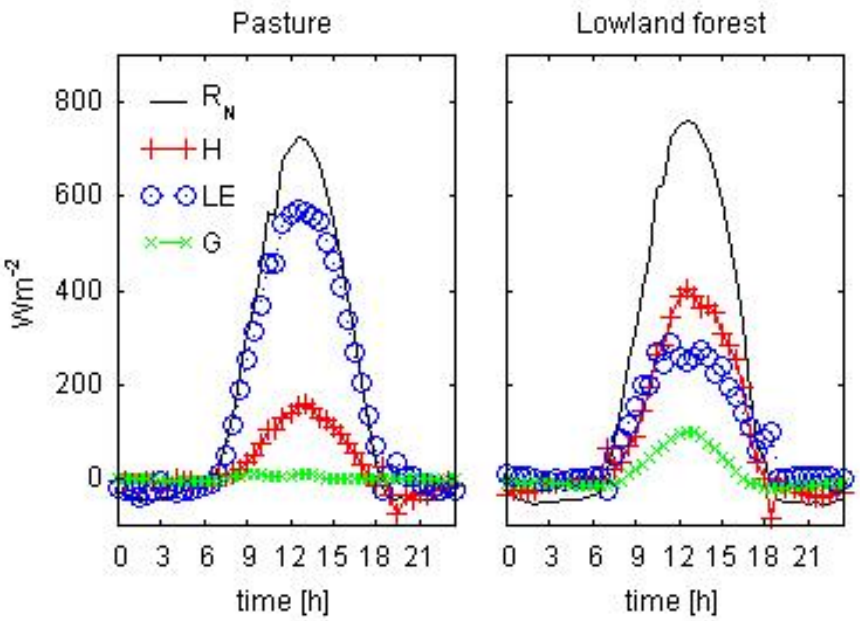
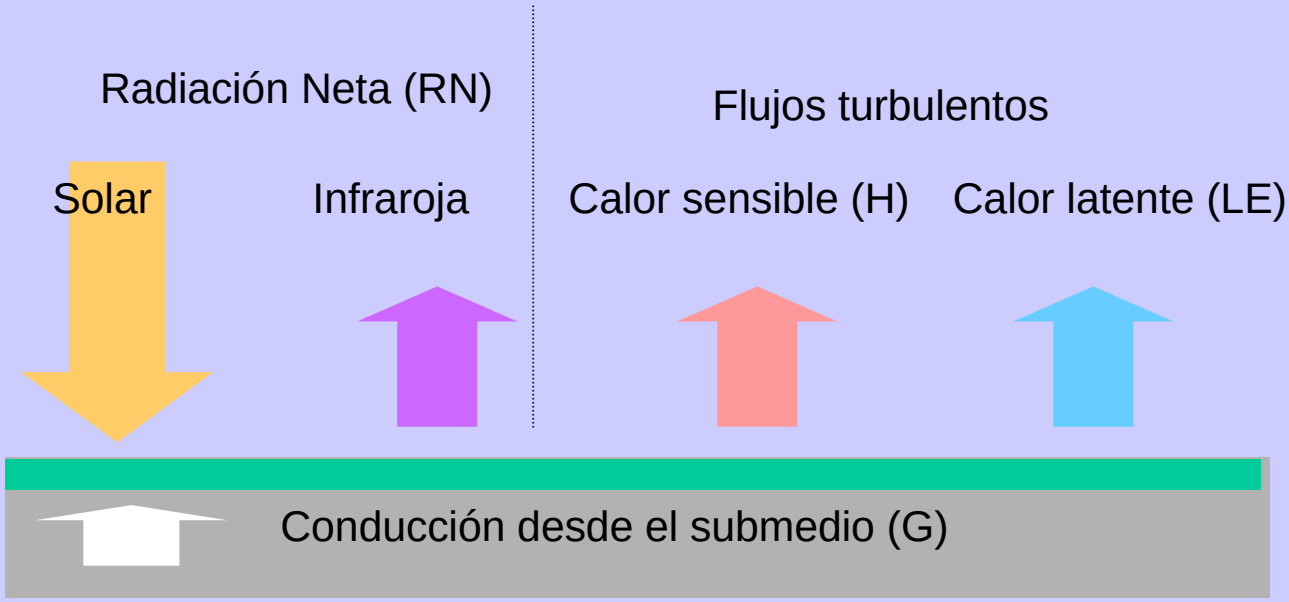




Balance de Energía Superficial



$$\rho c_p H \frac{\partial T}{\partial t} = RN + H + LE + G$$

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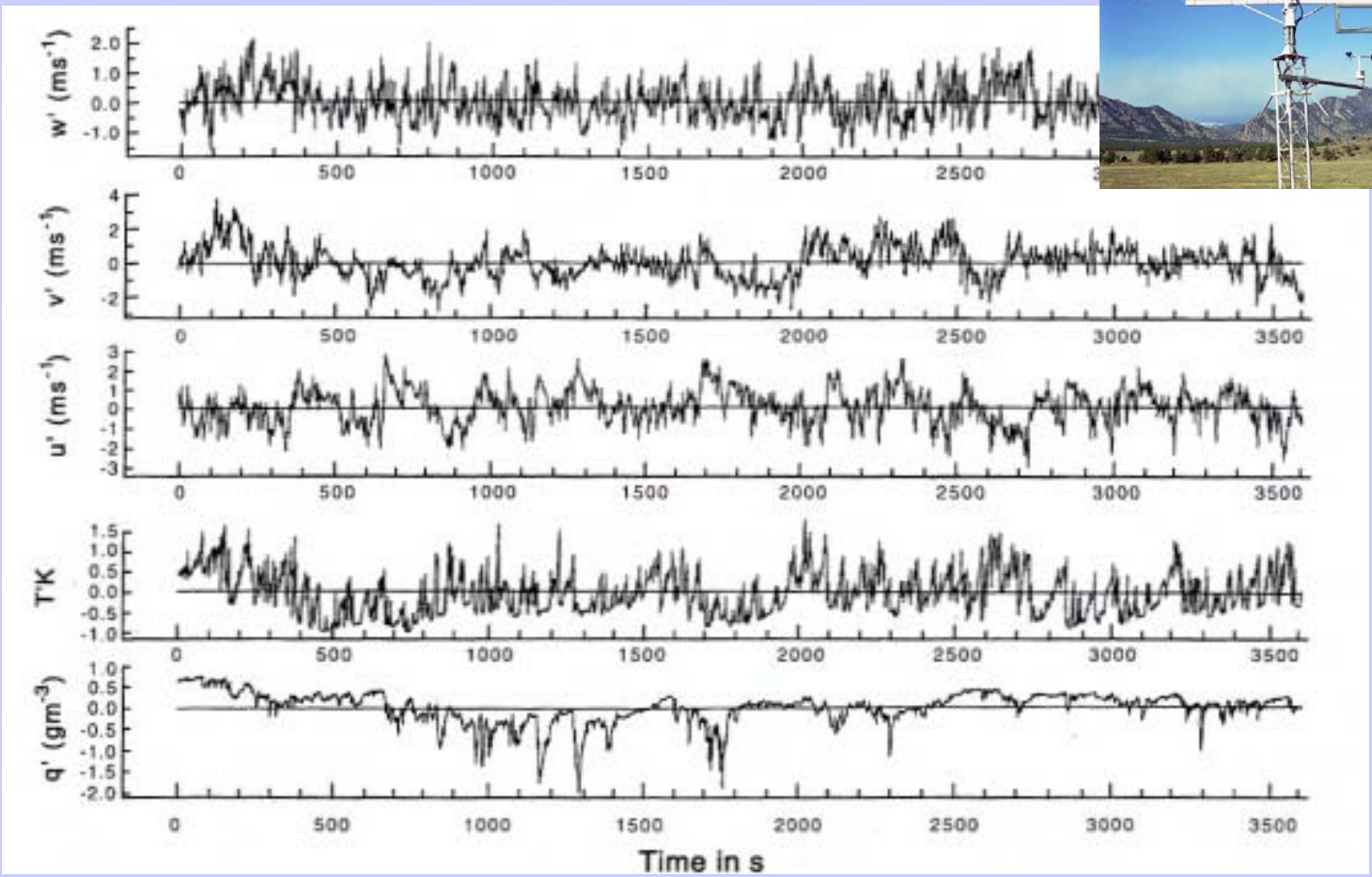
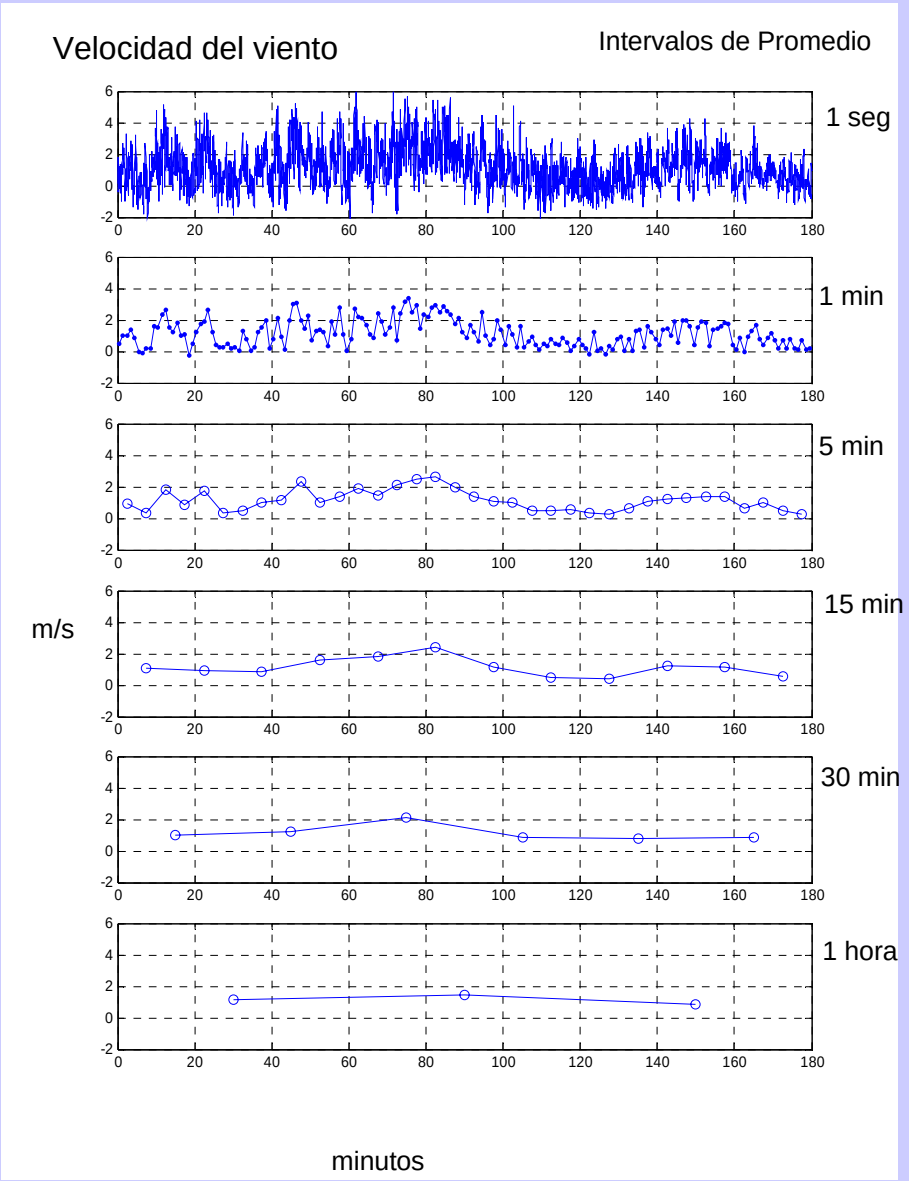
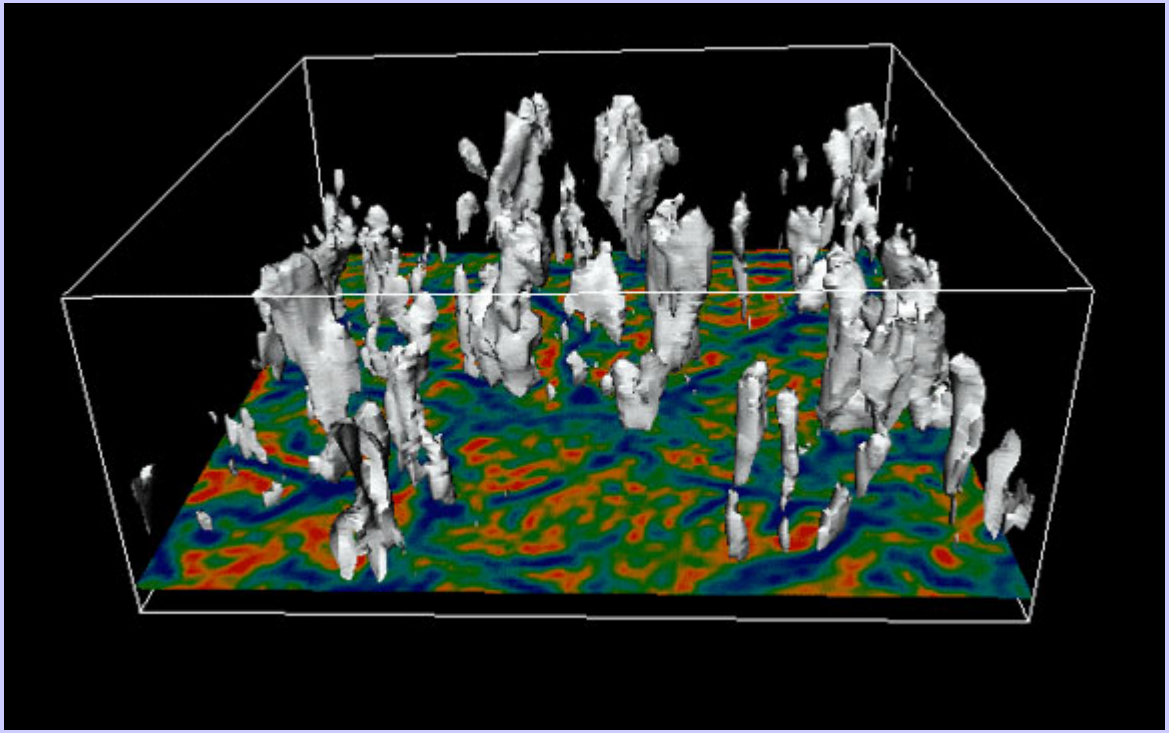


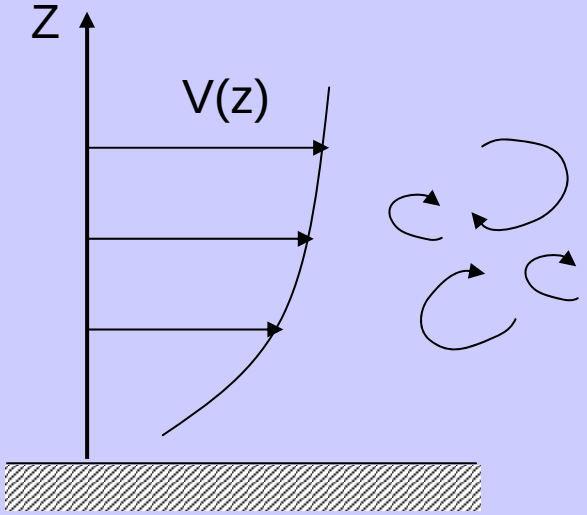

Velocidad del viento
Intervalos de Promedio
1 seg
1 min
5 min
15 min
30 min
1 hora
m/s
minutos

Turbulencia atmosférica

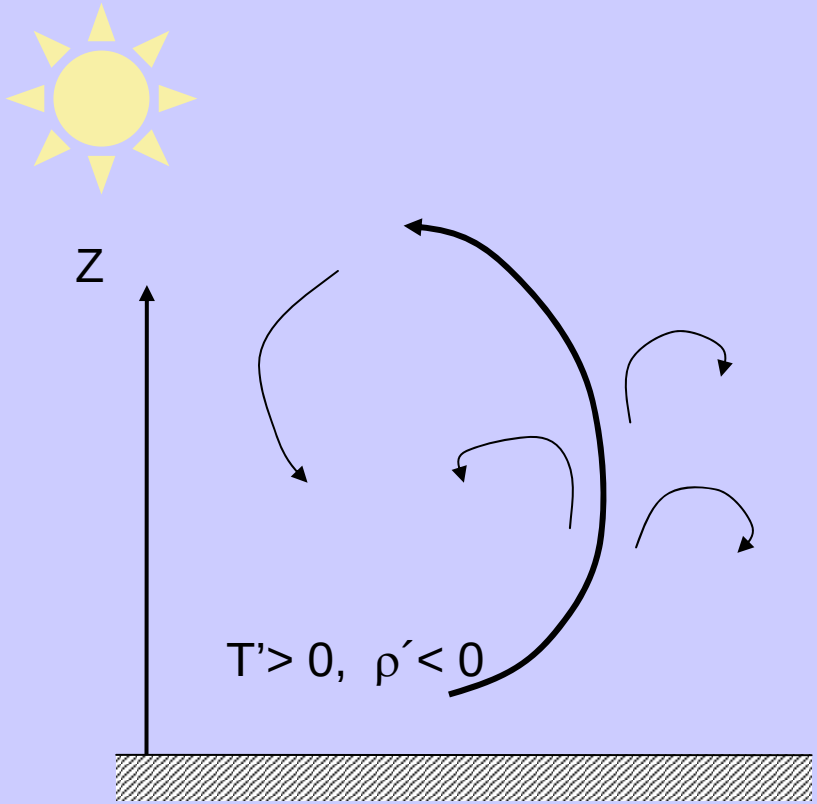


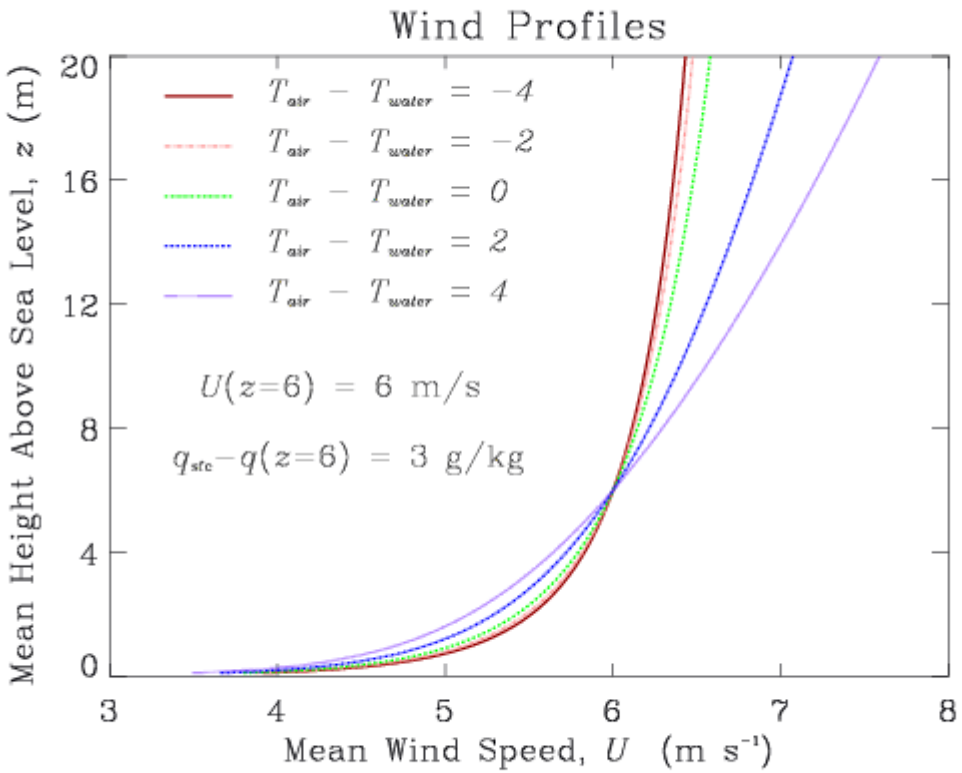
Factores de la Turbulencia atmosférica

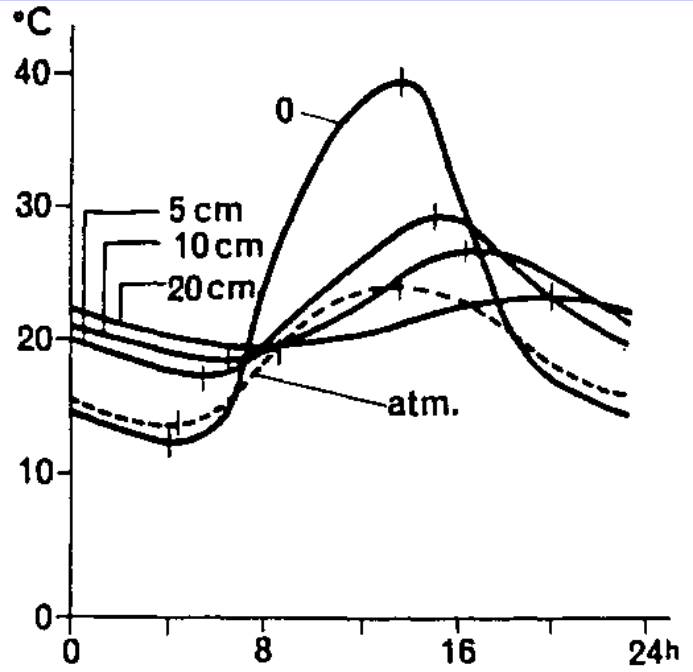
Turbulencia mecánica:
se produce cuando la velocidad del viento cambia en el espacio
(cizalle del viento)

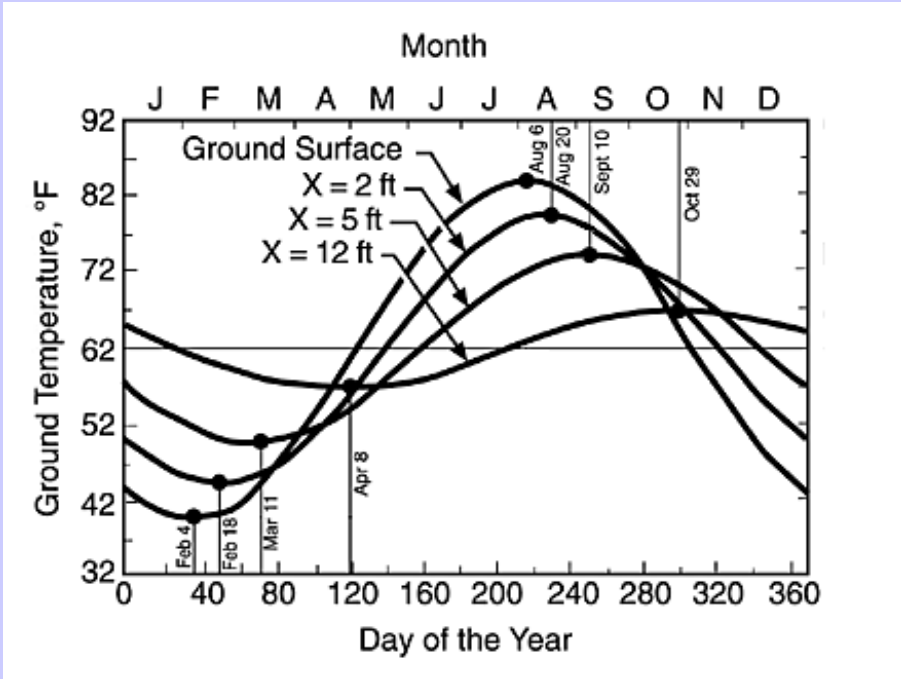


Turbulencia convectiva




Wind Profiles
$T_{air} - T_{water} = -4$
$T_{air} - T_{water} = -2$
$T_{air} - T_{water} = 0$
$T_{air} - T_{water} = 2$
$T_{air} - T_{water} = 4$
$U(z=6) = 6$ m/s
$q_{sfc} - q(z=6) = 3$ g/kg
Mean Height Above Sea Level, z (m)
0
4
8
12
16
20
3
4
5
6
7
8
Mean Wind Speed, U (m s⁻¹)


°C
40
30
20
10
0
0
5 cm
10 cm
20 cm
atm.
0
8
16
24h


Month
J F M A M J J A S O N D
92
82
72
62
52
42
32
Ground Temperature, °F
Ground Surface
X = 2 ft
X = 5 ft
X = 12 ft
Aug 6
Aug 20
Sept 10
Oct 29
Feb 4
Feb 18
Mar 11
Apr 8
0
40
80
120
160
200
240
280
320
360
Day of the Year