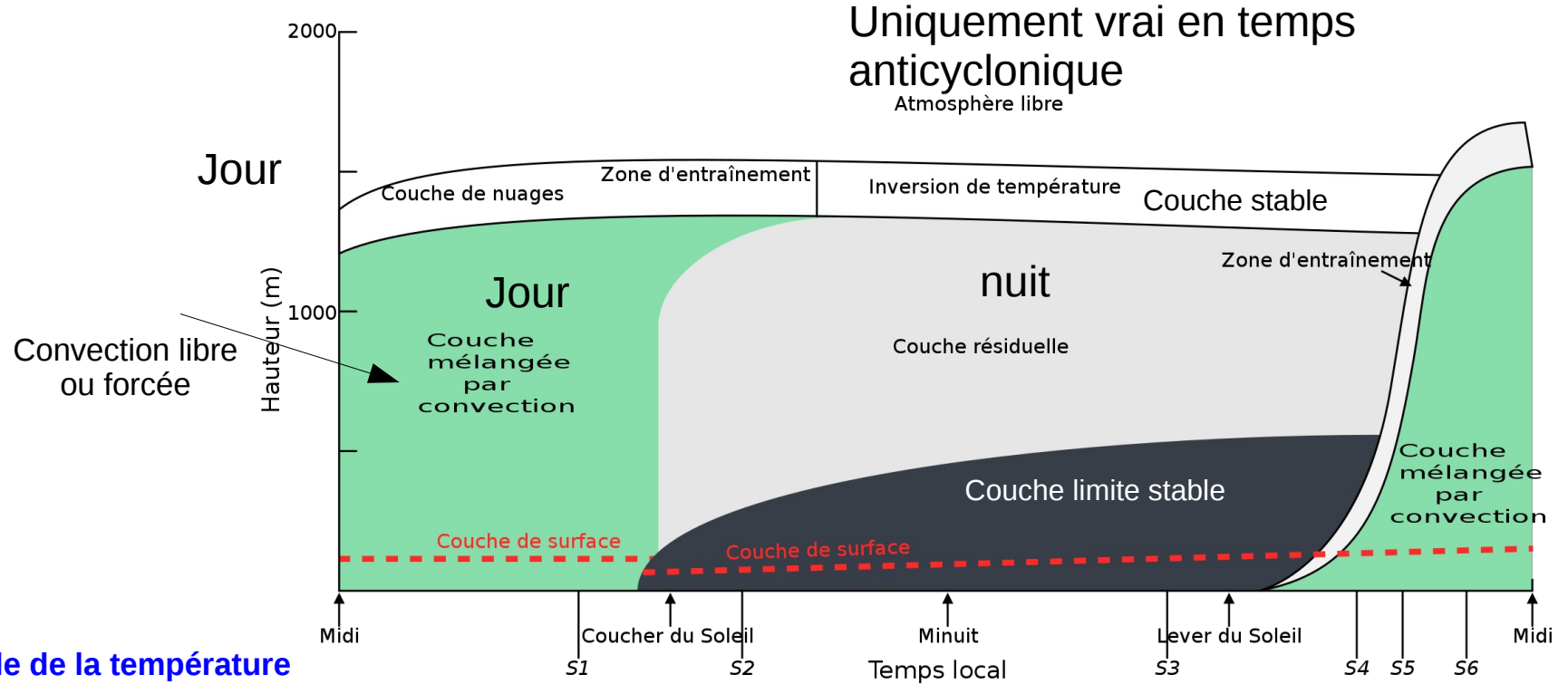


# 1. Couche limite

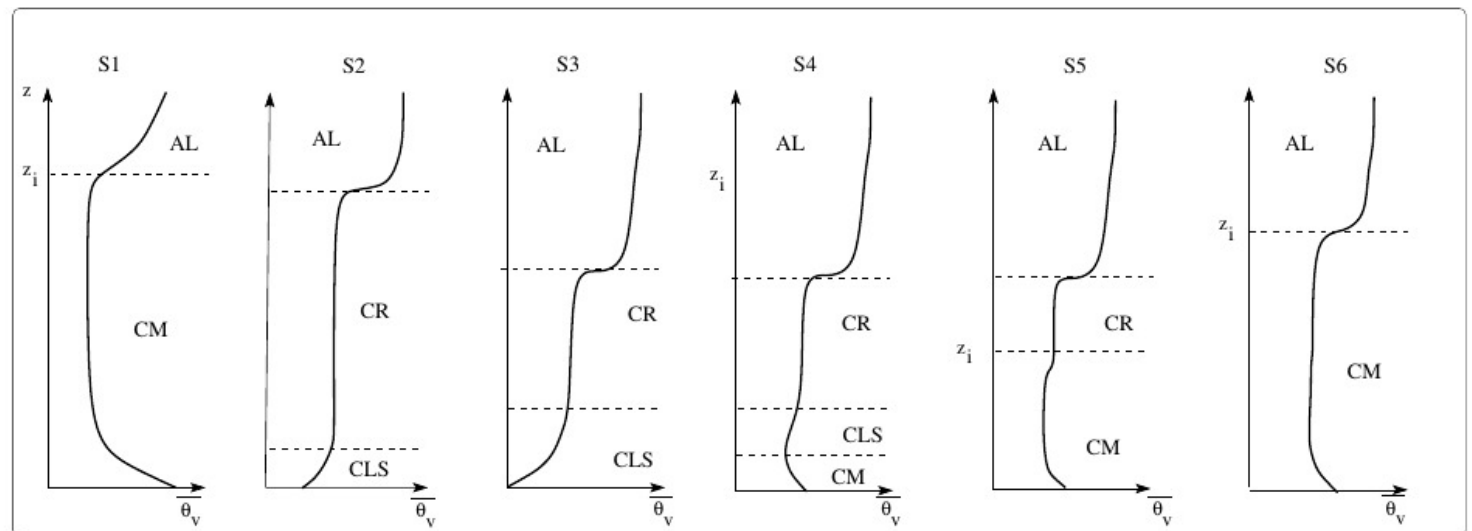


Profile de la température virtuelle potentielle

stable

neutre

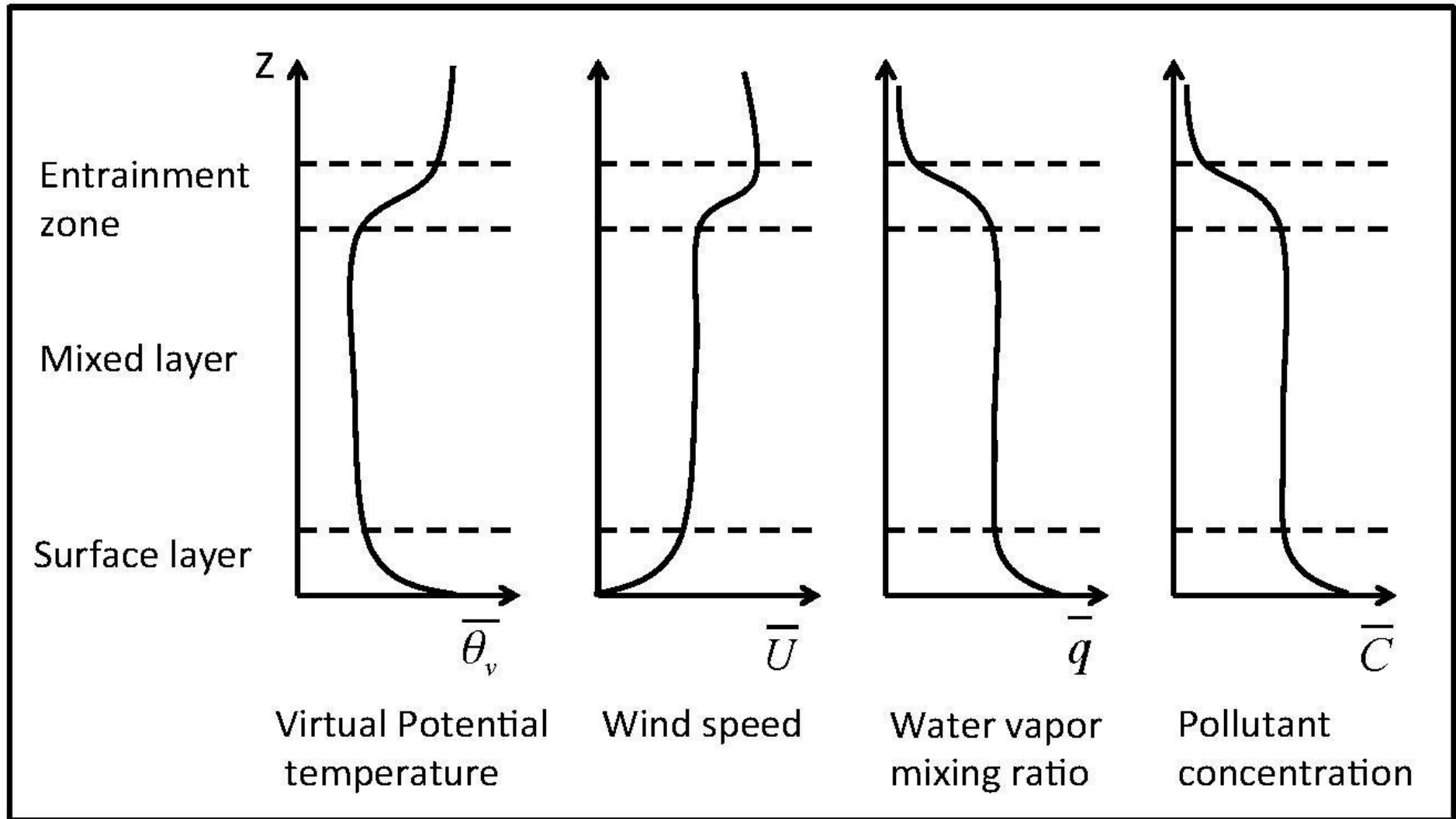
instable



CM = couche de mélange  
CLS = couche limite stable  
CR = couche résiduelle  
AL = atmosphère libre

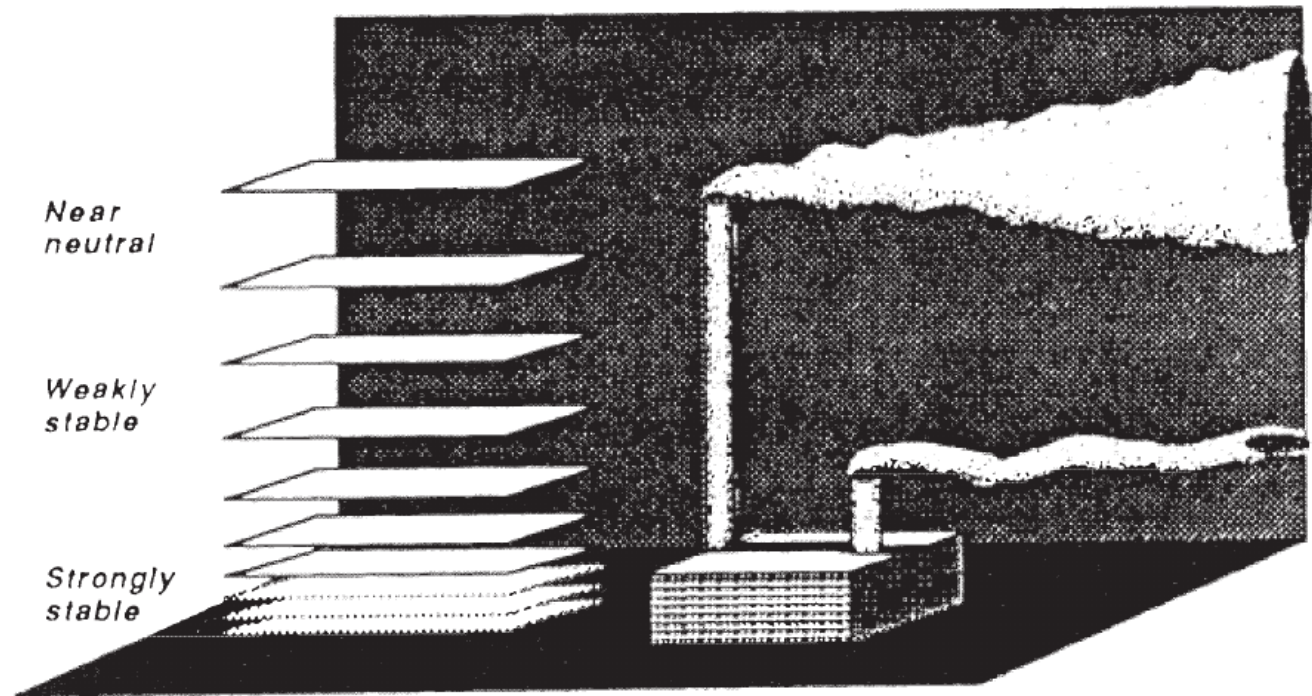
# 1. Couche limite

A midi, si conditions anticycloniques ...



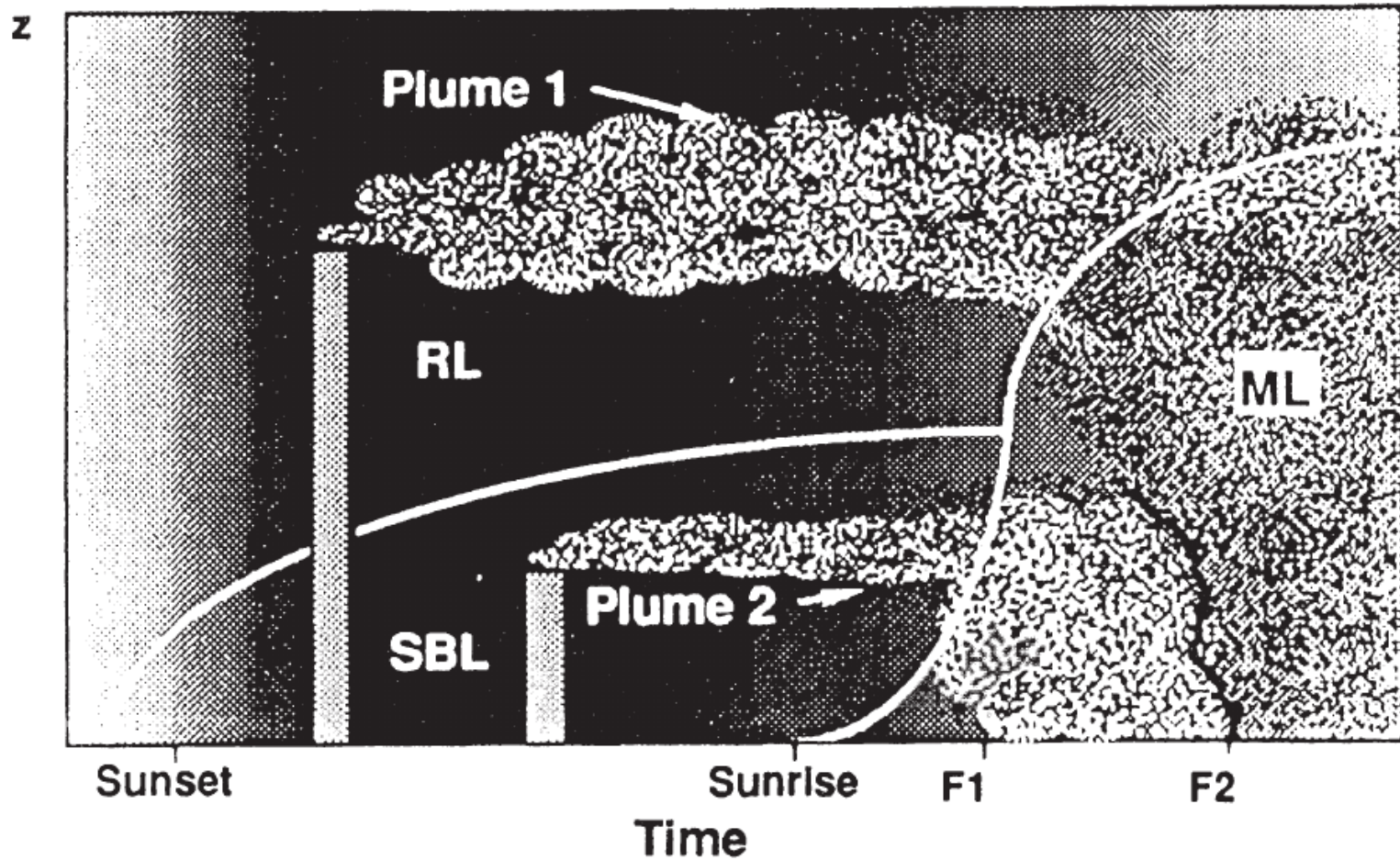
# 1. Couche limite

Pendant la nuit ...



**Fig. 1.10** The static stability decreases with height in the nocturnal boundary layer, gradually blending into the neutrally-stratified residual layer aloft, as indicated by the isentropic surfaces sketched on the left. Smoke emissions into the stable air fan out in the horizontal with little vertical dispersion other than wavelike oscillations. Smoke emissions in the neutral residual-layer air spread with an almost equal rate in the vertical and horizontal, allowing the smoke plume to assume a cone-like shape.

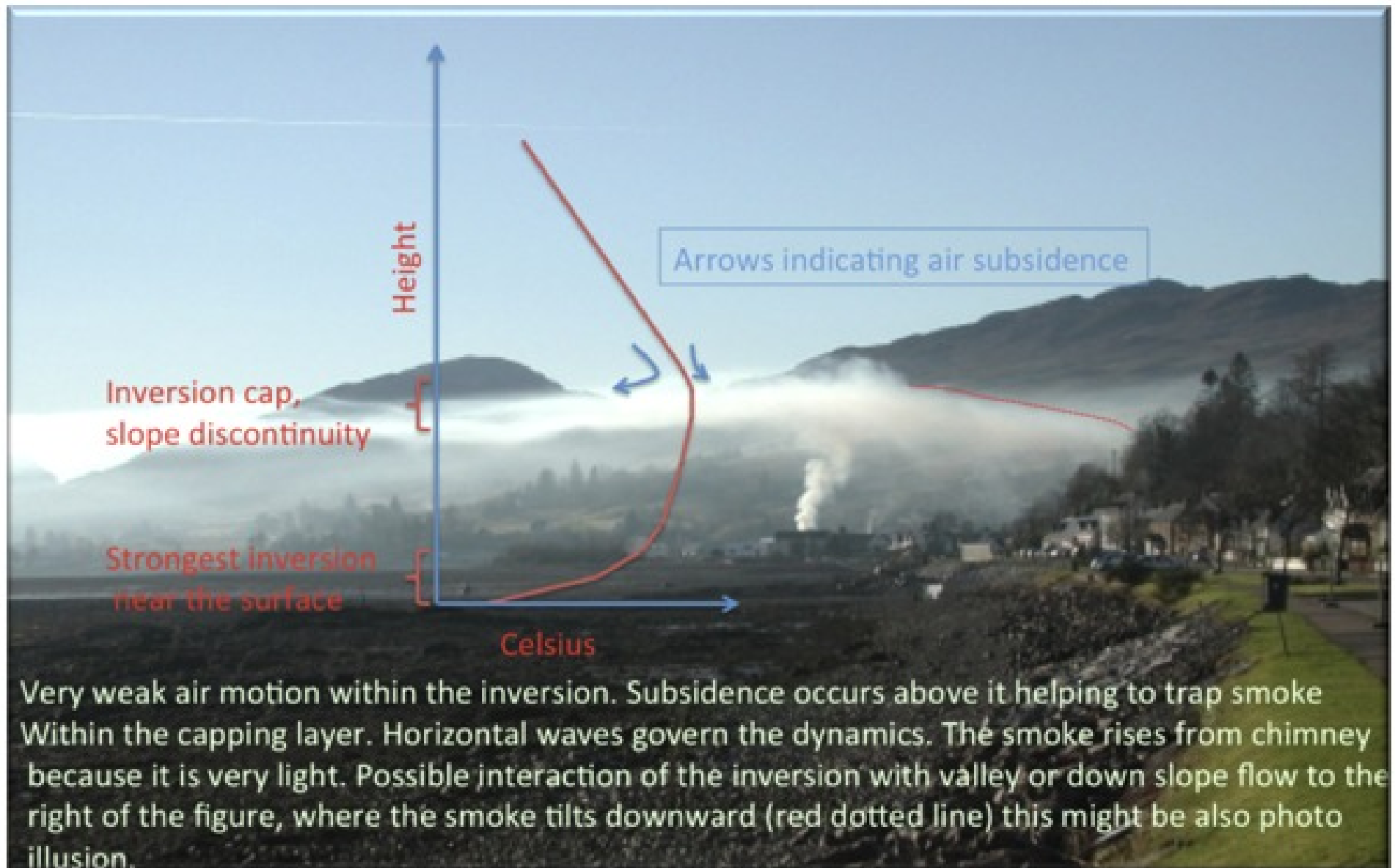
## 1. Couche limite



**Fig. 1.14** Sketch of the fumigation process, where a growing mixed layer mixes elevated smoke plumes down to the ground. Smoke plume 1 is fumigated at time  $F_1$ , while plume 2 is fumigated at time  $F_2$ .



# 1. Couche limite



## 2. Brise de mer - terre

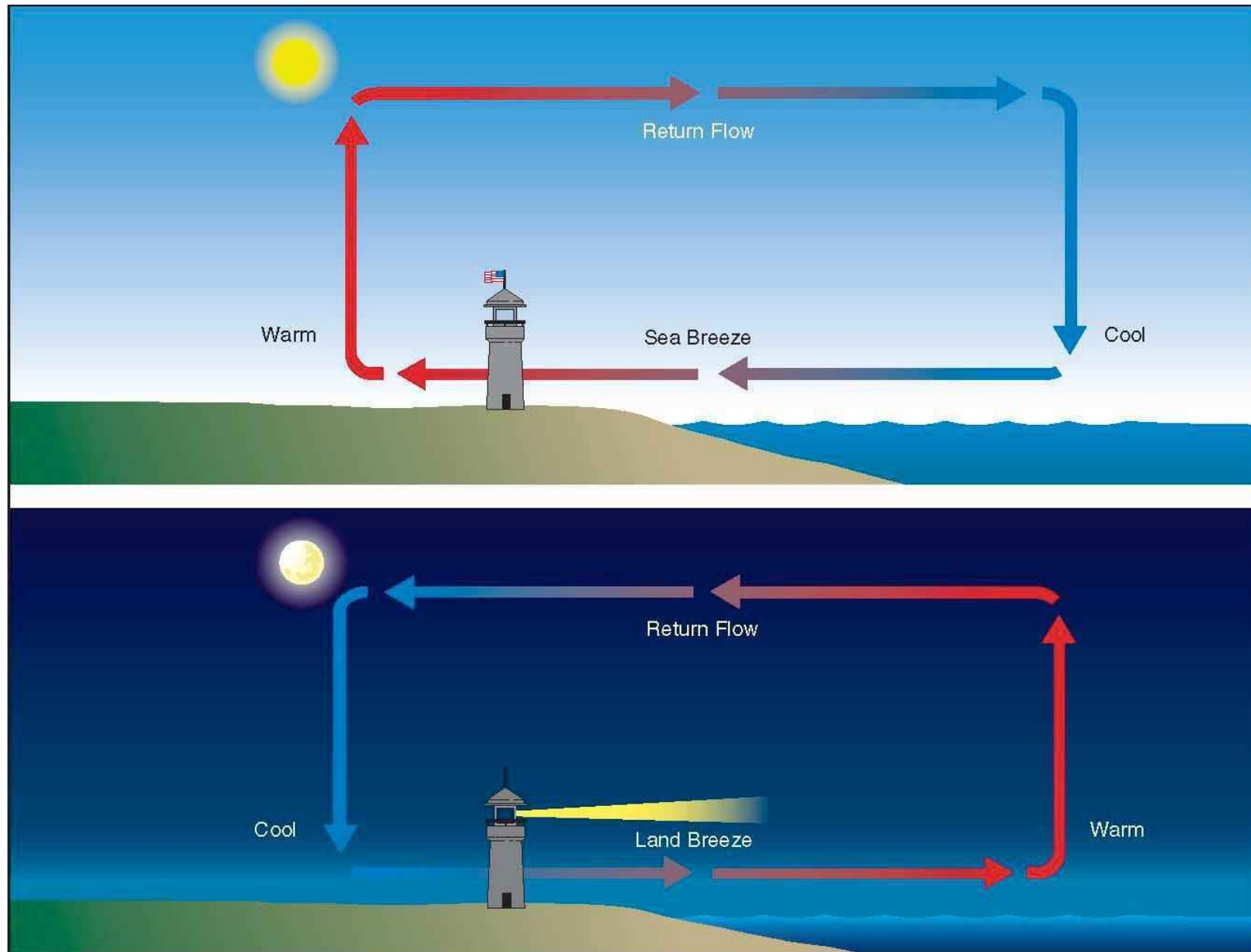
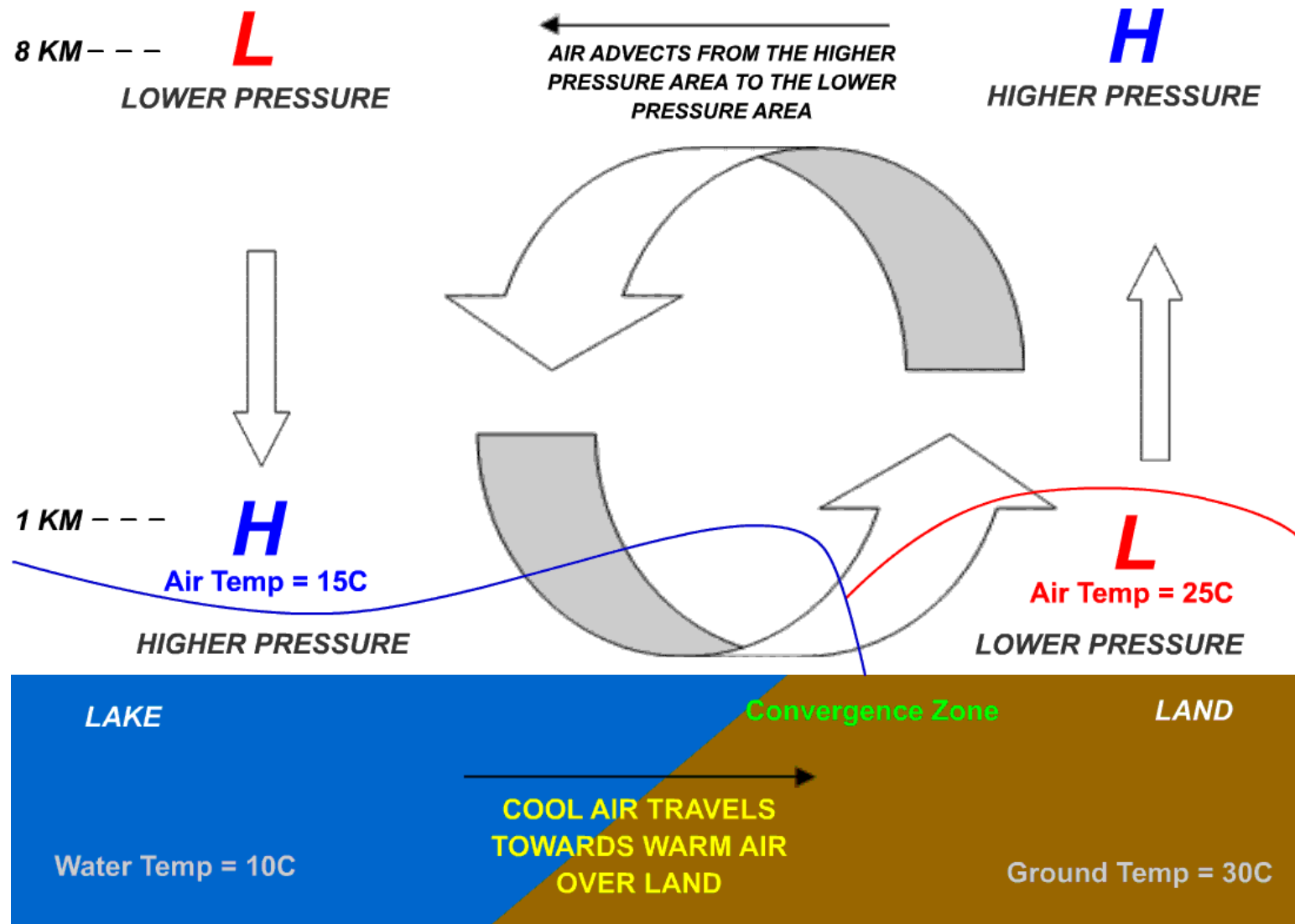


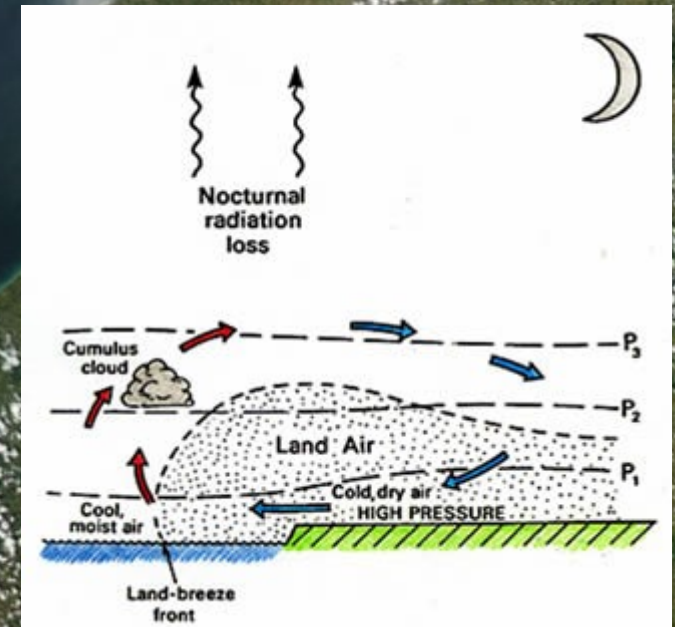
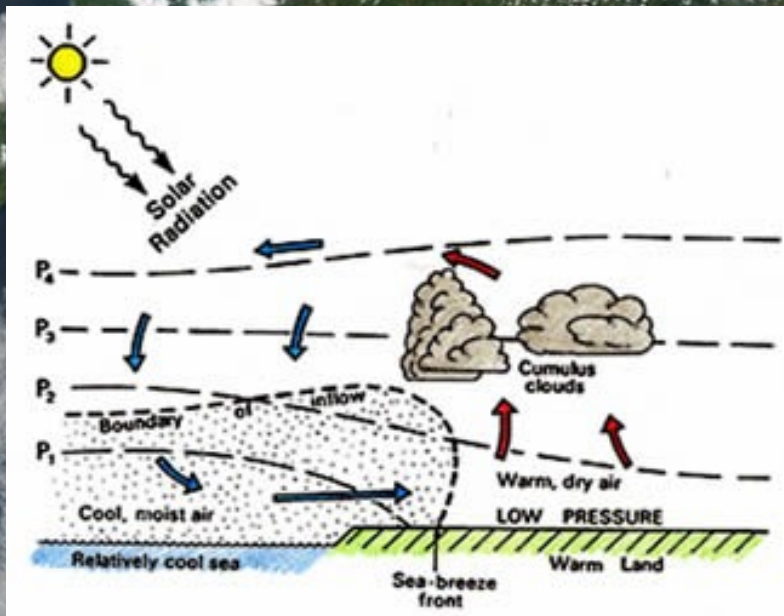
Figure 10-13. Sea breeze and land breeze wind circulation patterns.

## 2. Brise de mer - terre





## 2. Brise de mer - terre





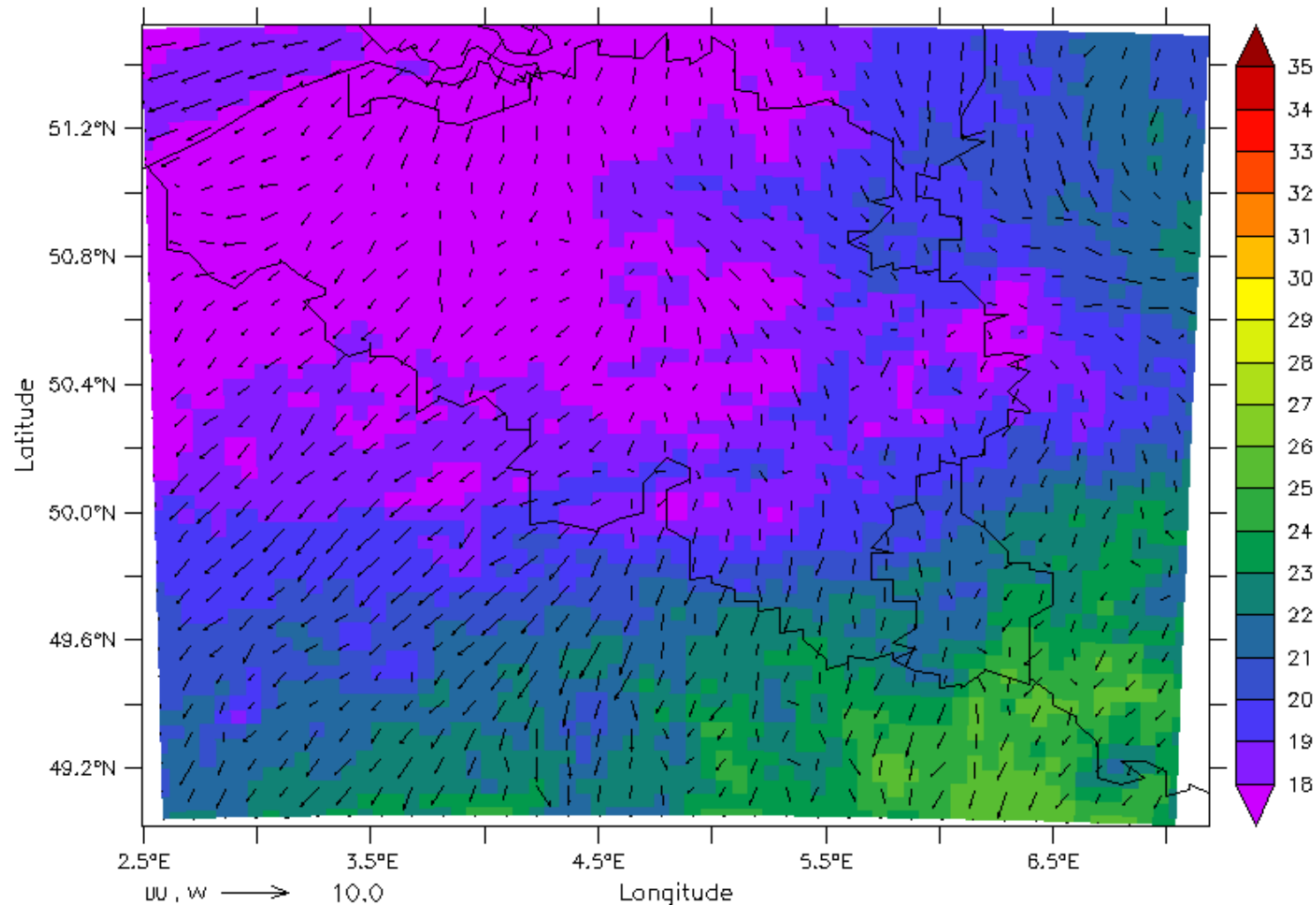
## 2. Brise de mer - terre

En Belgique, ... simulé par le modèle MAR

FERRET (optimized) Ver.7.1  
NOAA/PMEL TMAP  
08-DEC-2017 15:58:28

Z (sigma\_level) : 0.9996  
TIME : 03-AUG-2003 00:00

DATA SET: MARv3.7-2003-hourly

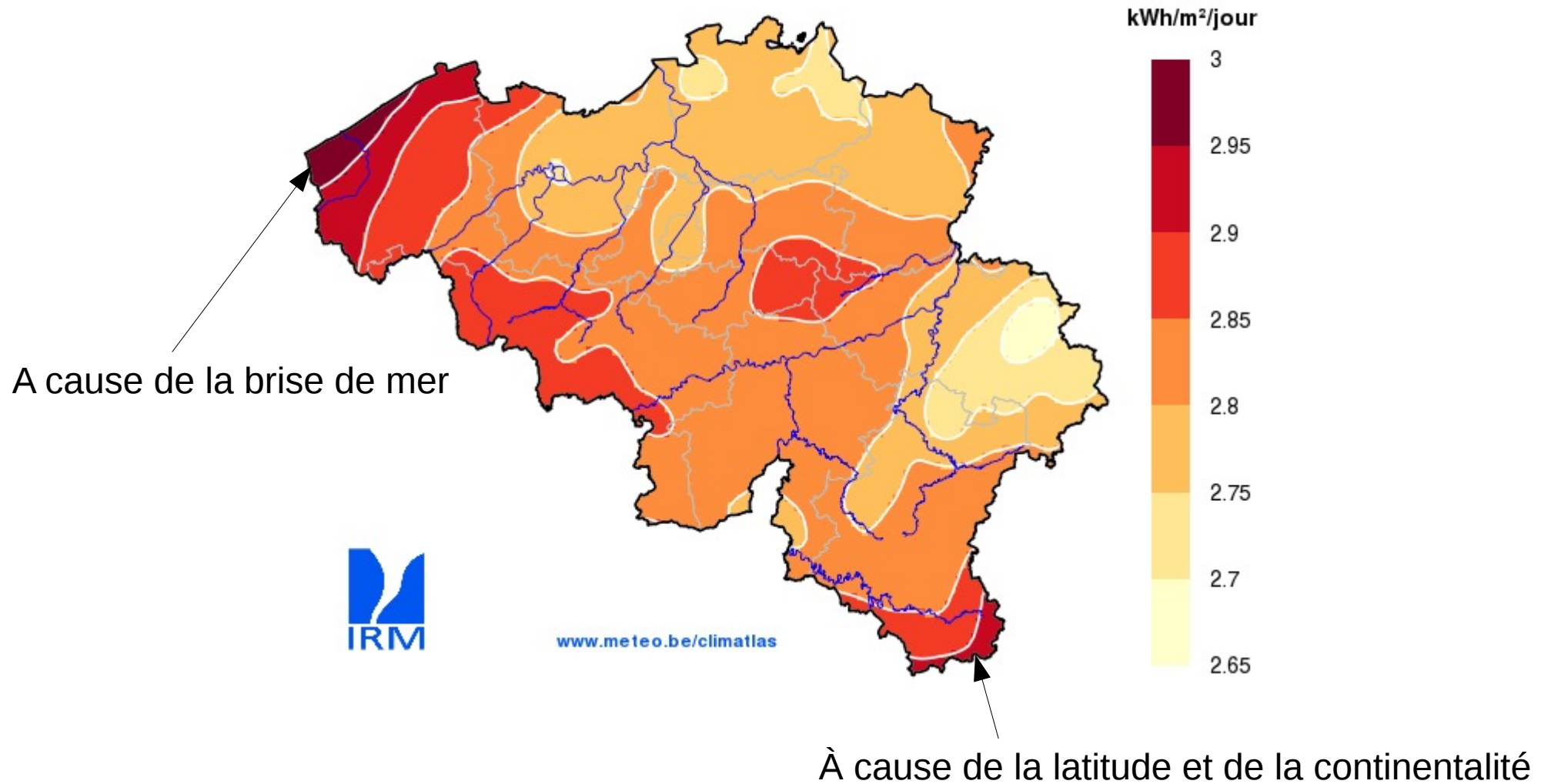


Temperature (C)

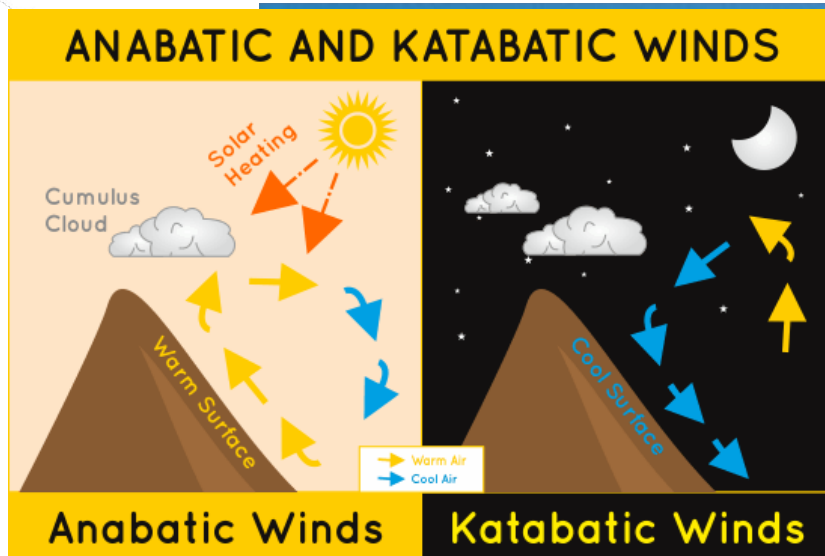
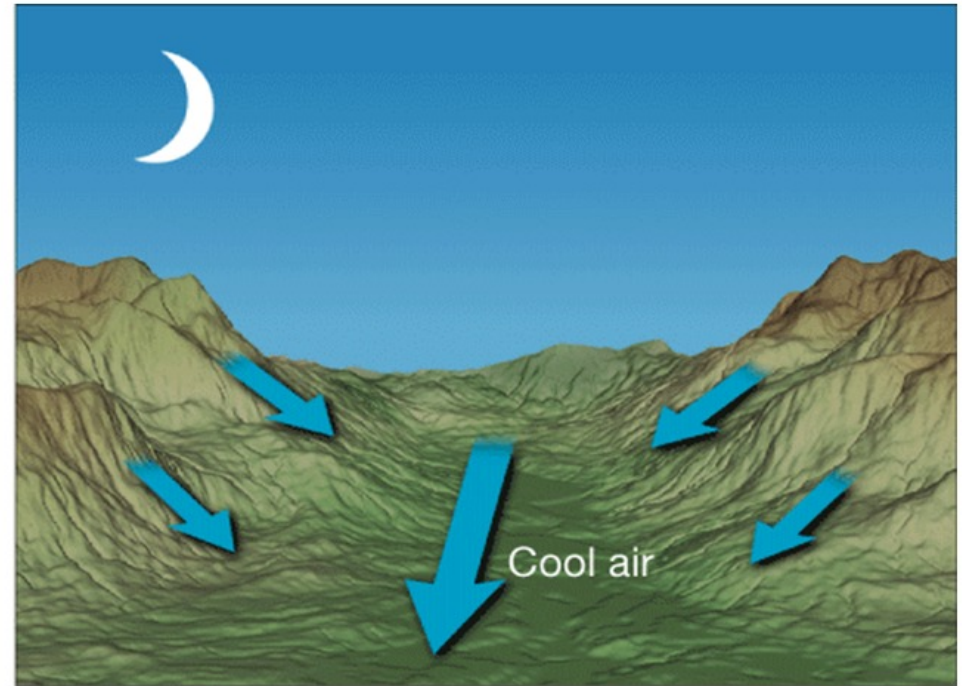
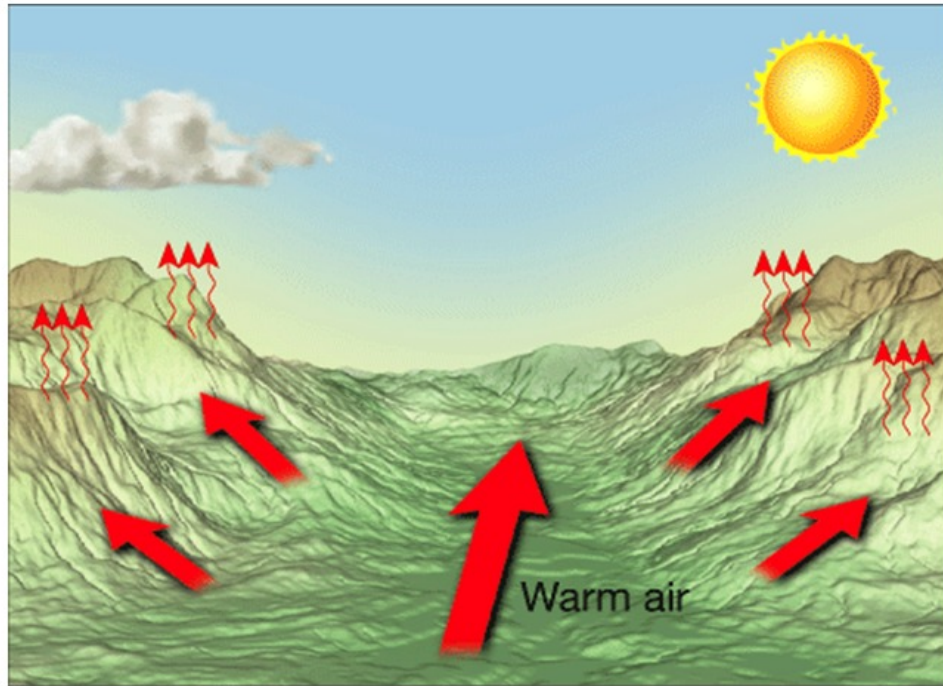
## 2. Brise de mer - terre

Fait-il plus beau à la côte ??

Rayonnement solaire global journalier, moyenne annuelle  
Normales 1984 - 2013



# 3. Brise de vallée





# 3. Brise de vallée

## Utilisation des vents catabatiques

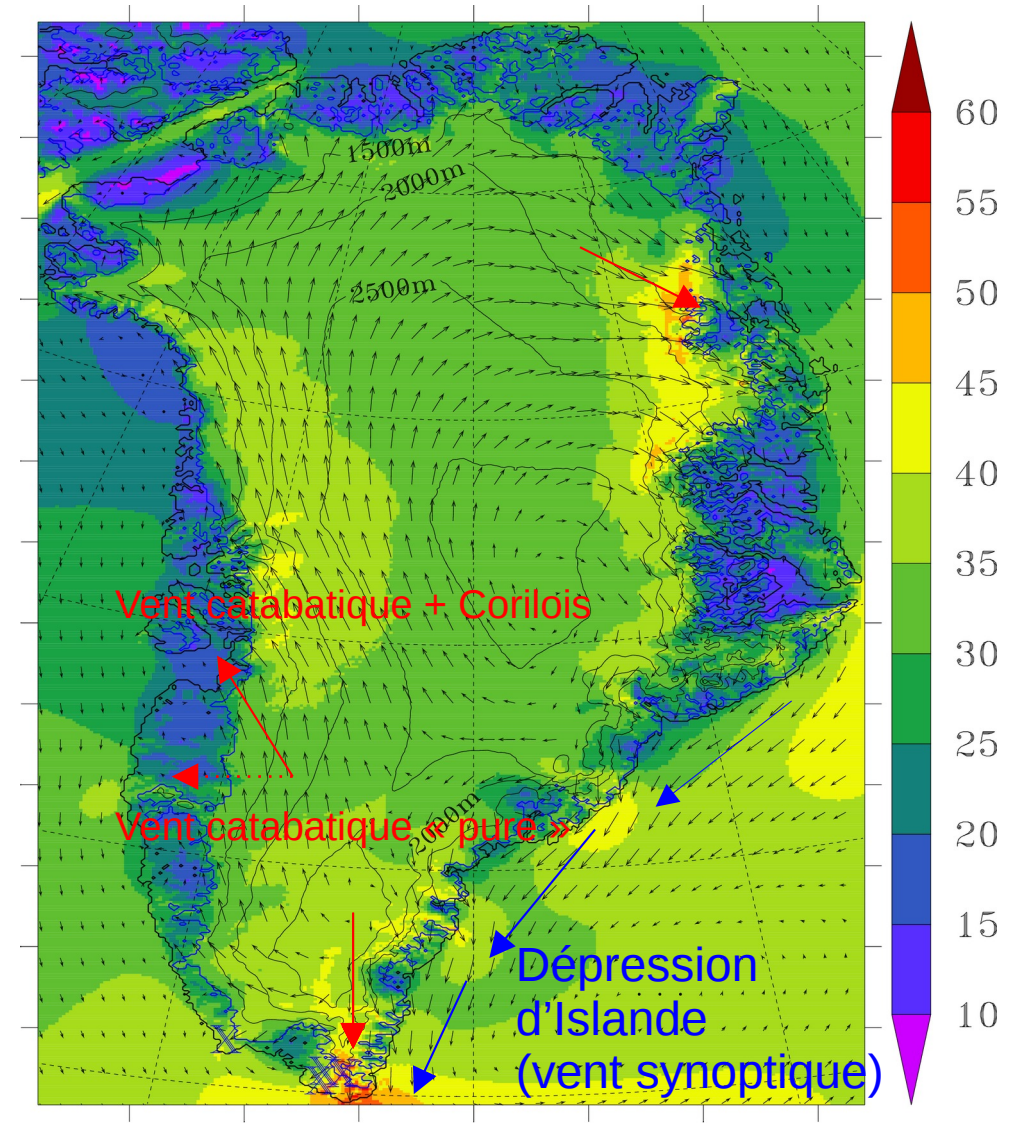
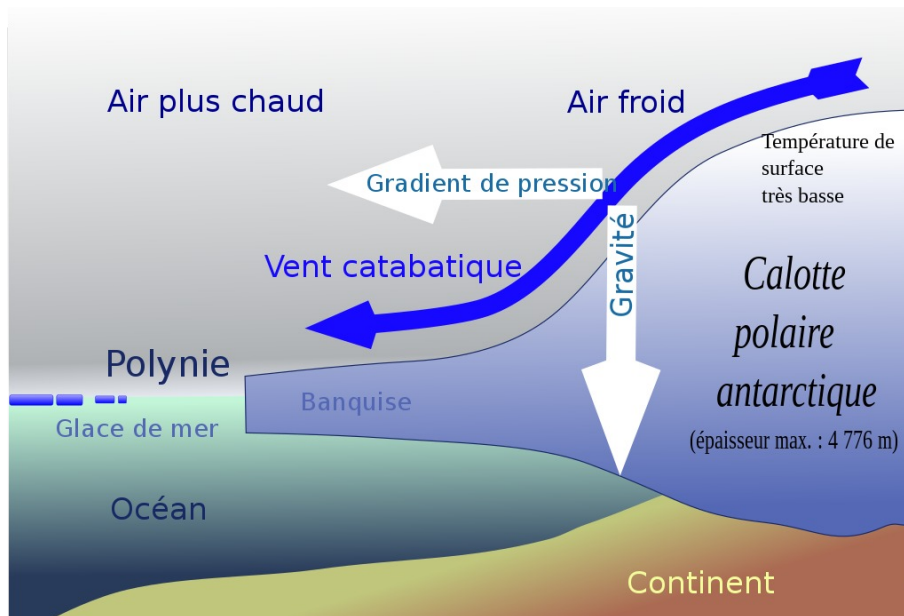


Éoliennes dans le Valais (Suisse)



# 3. Brise de vallée

**Utilisation des vents catabatiques :  
(quand le vent local souffle dans la même  
direction que le vent synoptique !)**

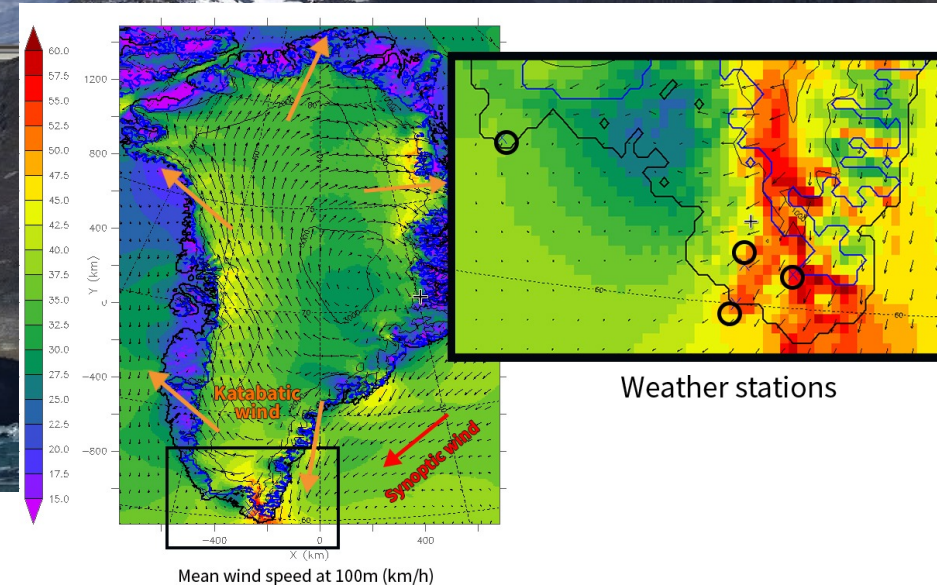
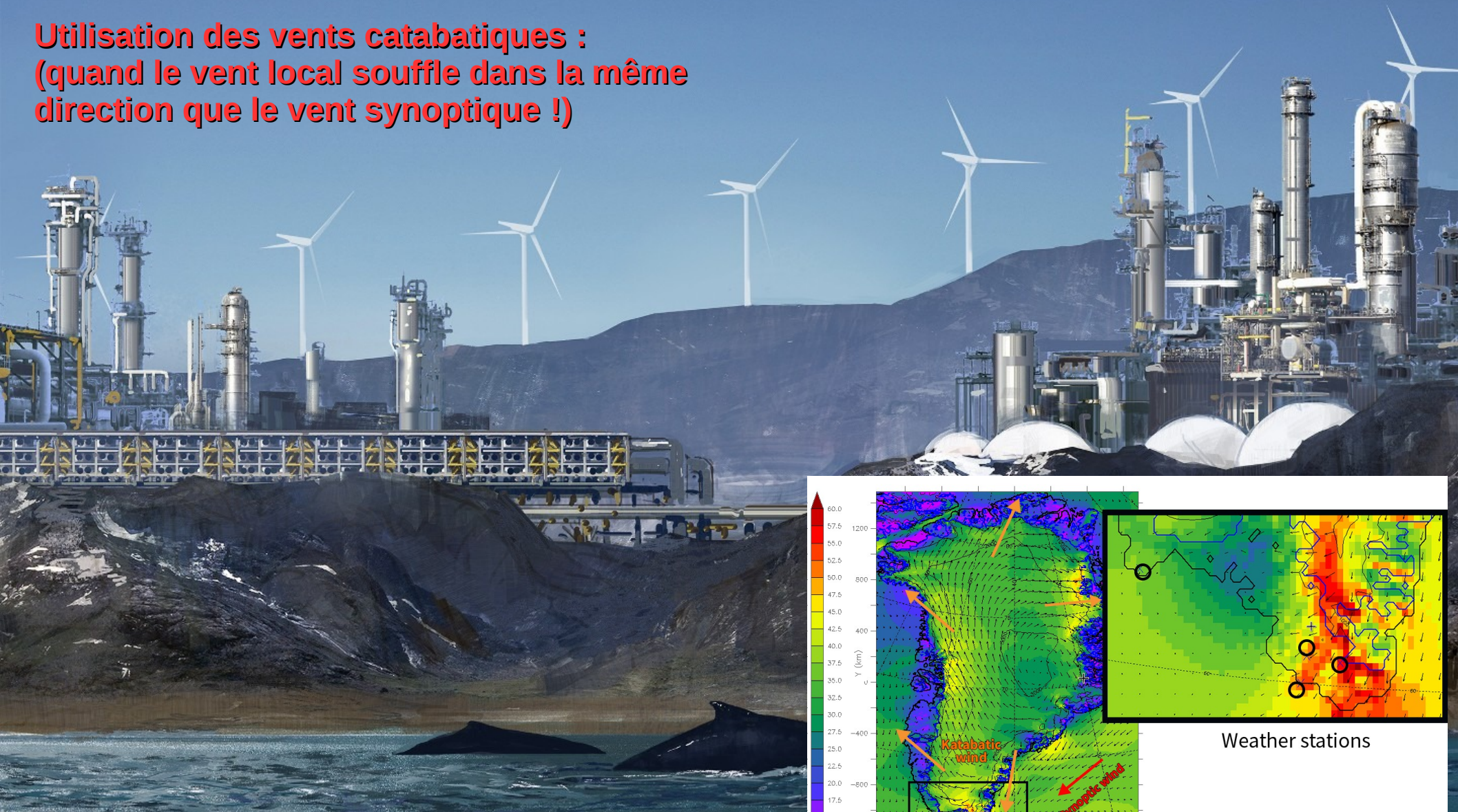


Mean Wind speed at 100m (km/h)



# 3. Brise de vallée

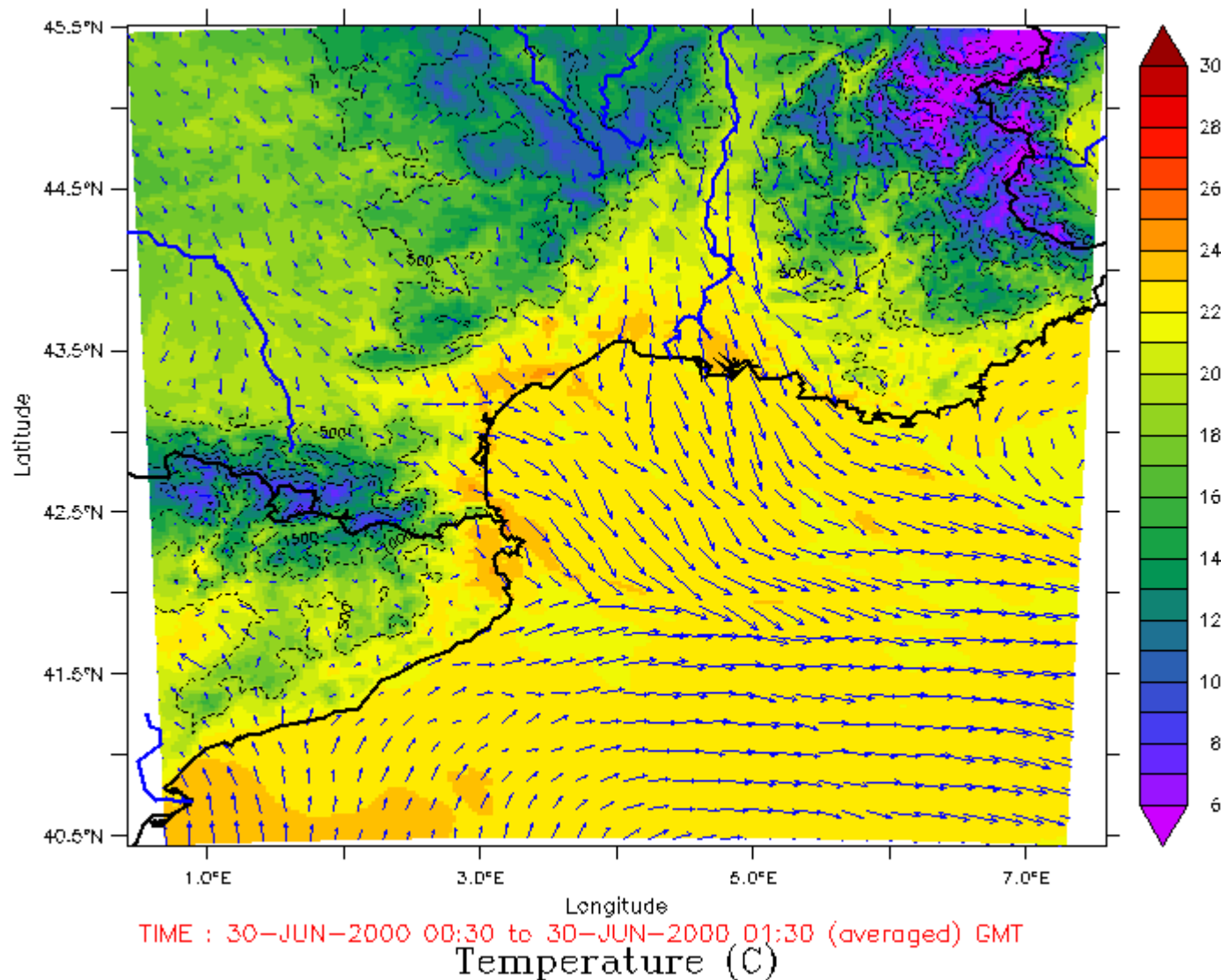
Utilisation des vents catabatiques :  
(quand le vent local souffle dans la même  
direction que le vent synoptique !)





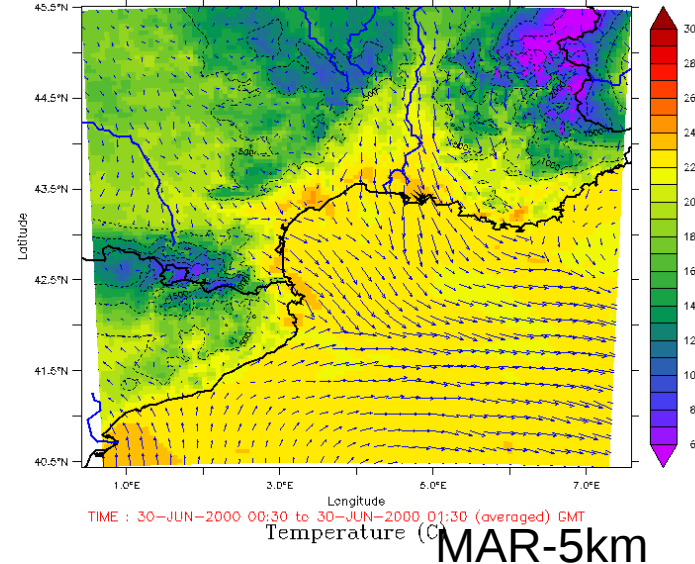
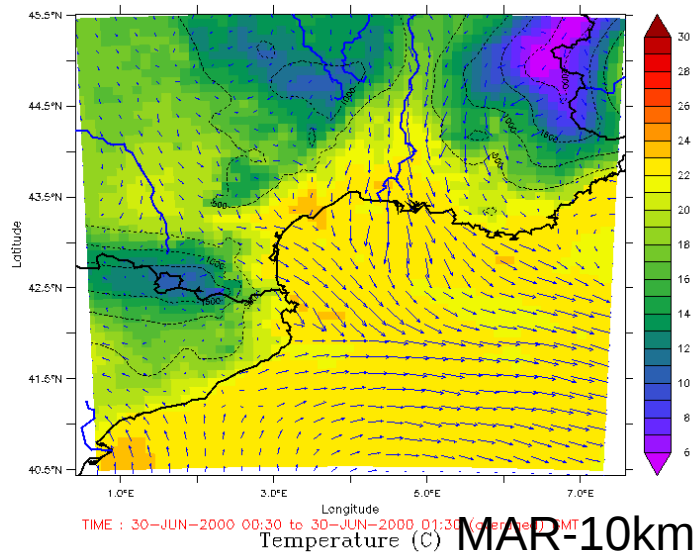
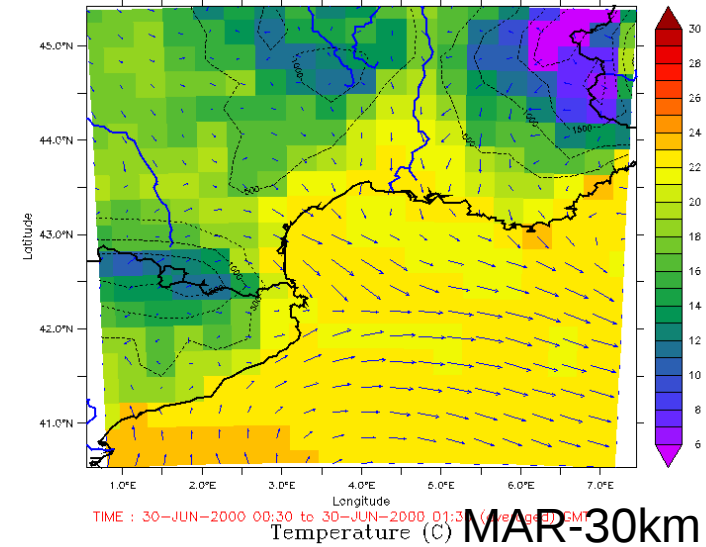
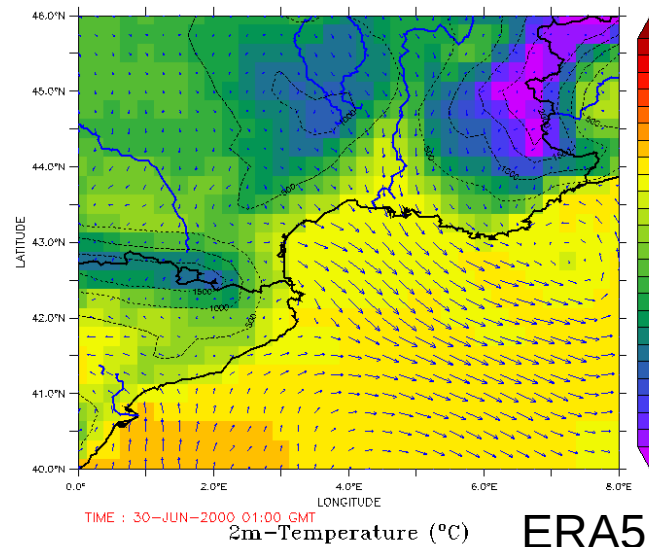
# 4. Brise de mer et de vallée

Simulée par MAR à 2.5km



# 4. Brise de mer et de vallée

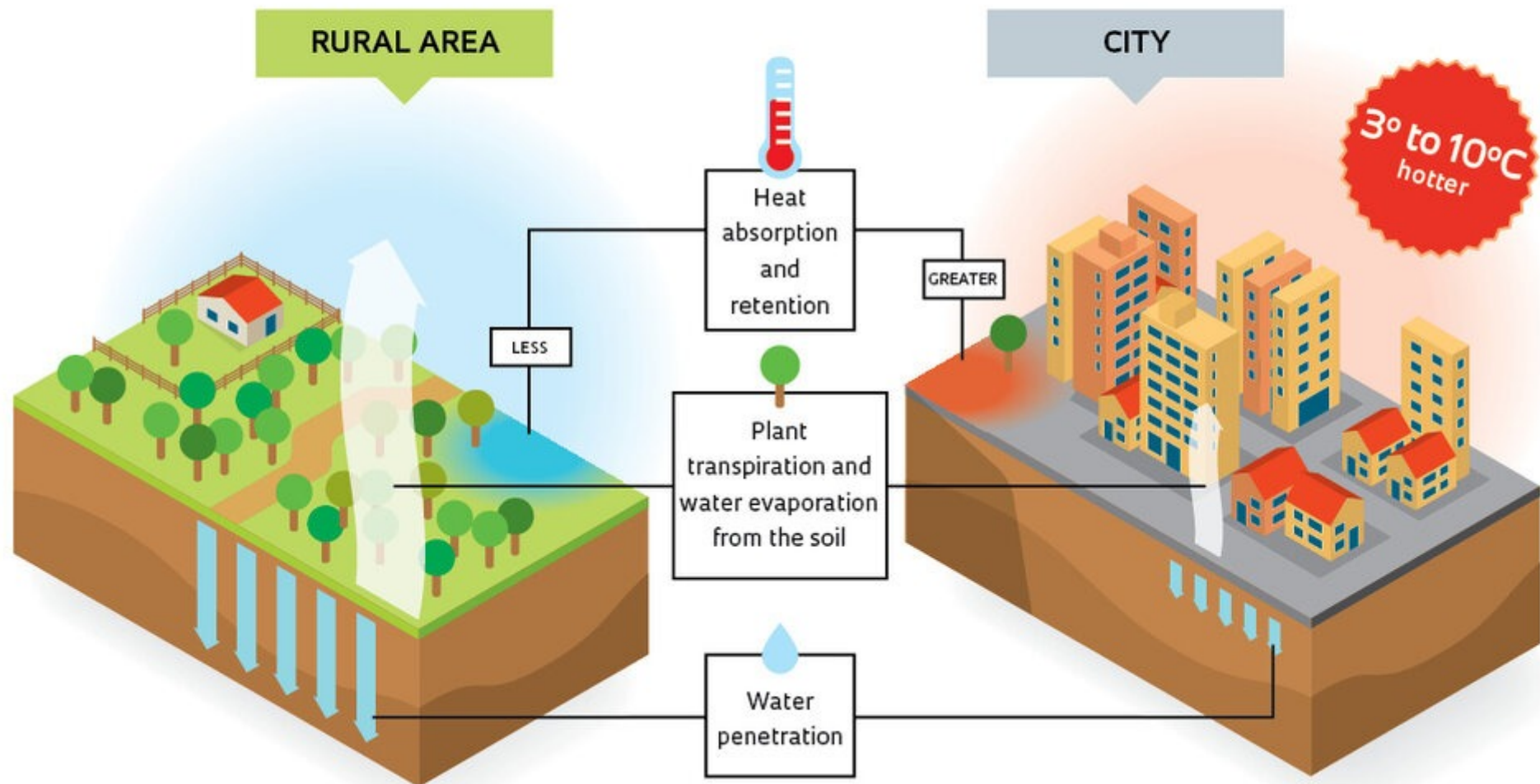
Simulée par MAR...



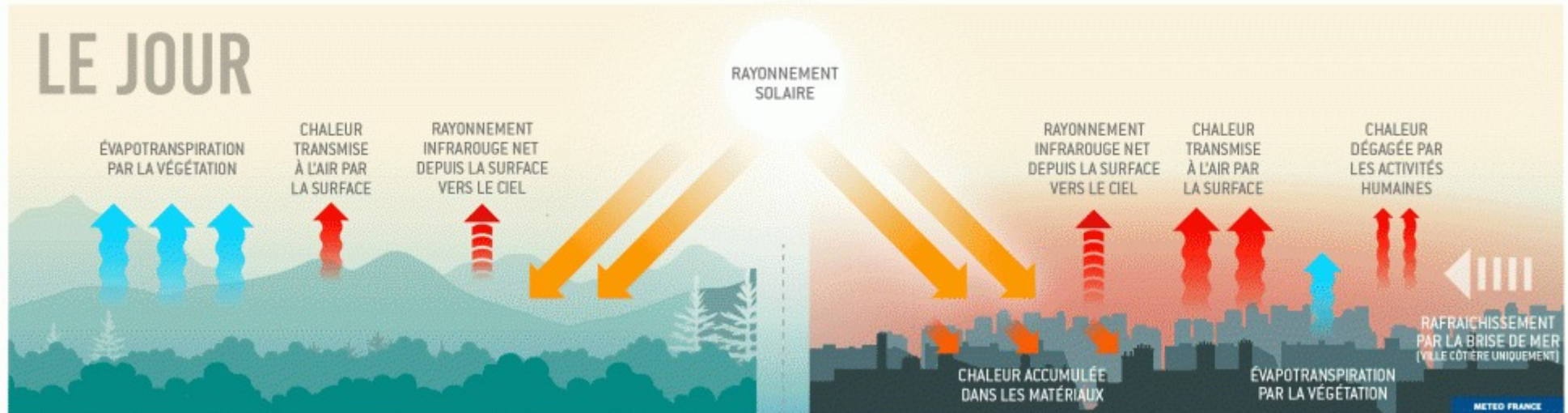


# 5. Îlot de chaleur urbain (UHI)

## Why the urban heat island effect occurs

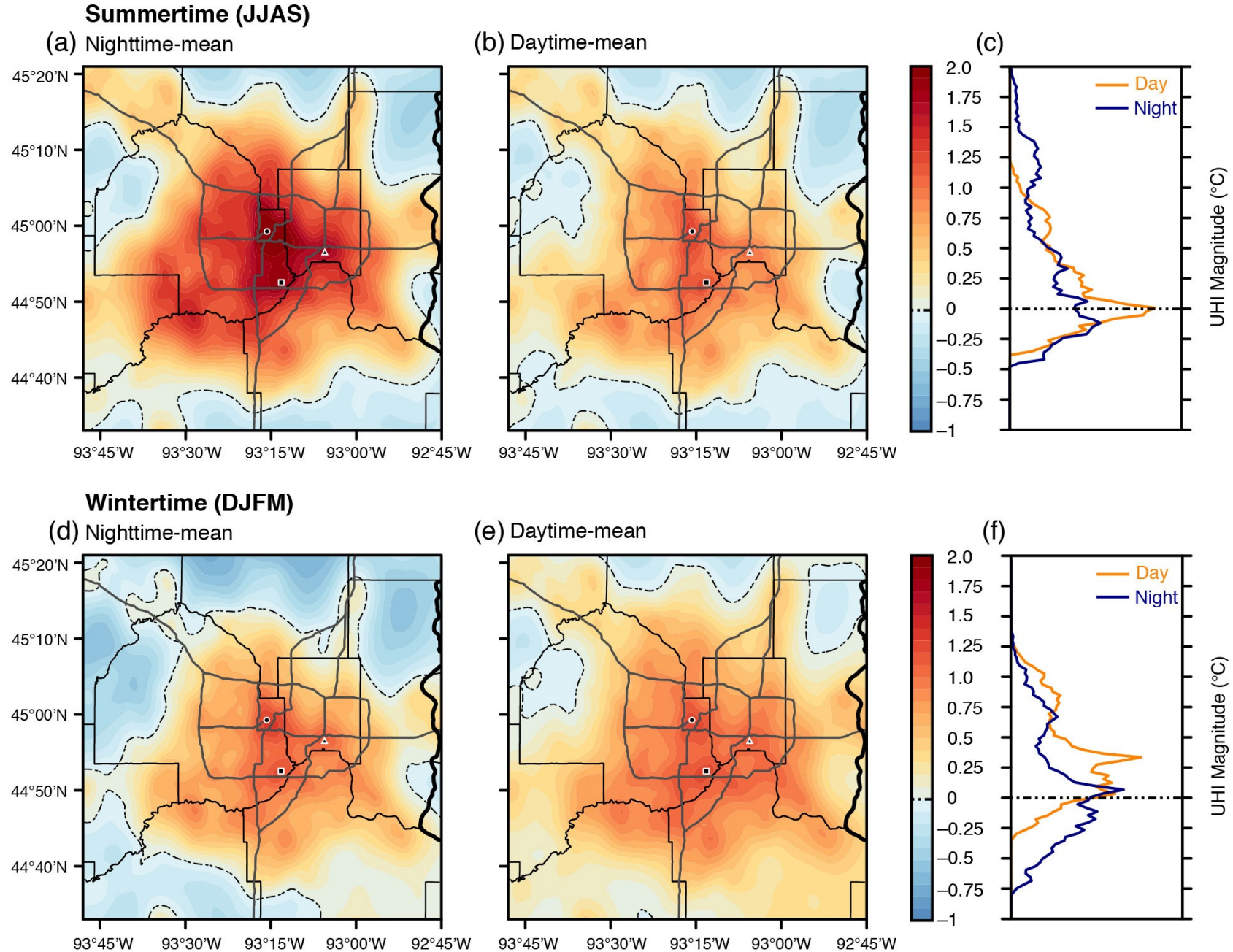


# 5. Îlot de chaleur urbain (UHI)





# 5. Îlot de chaleur urbain (UHI)

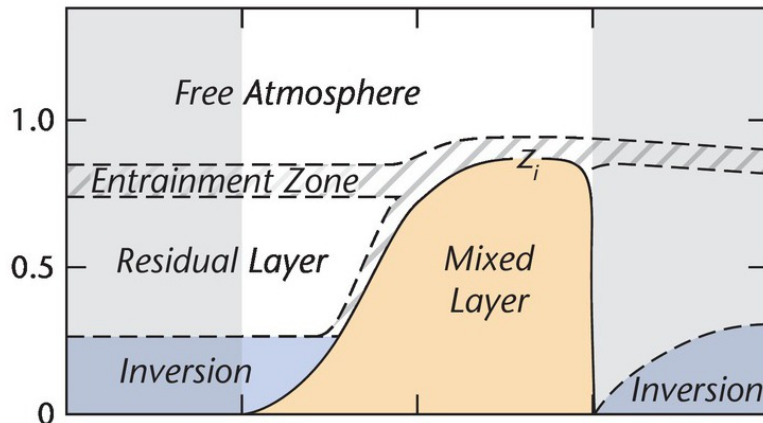




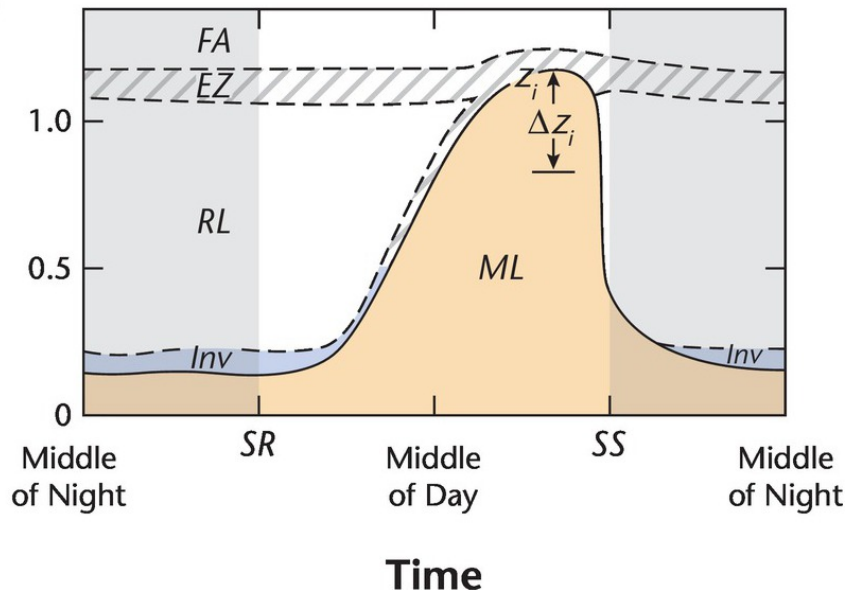
# 5. Îlot de chaleur urbain (UHI)

## Impact dans le temps ...

(a) Rural



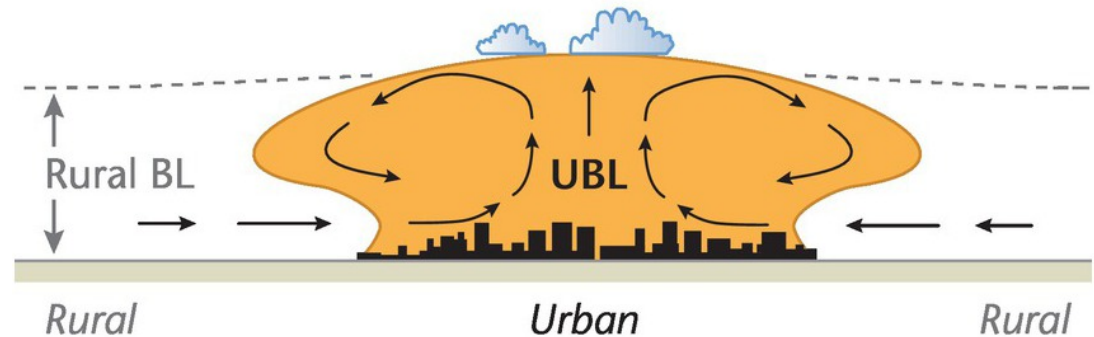
(b) Urban



## Impact dans l'espace ...

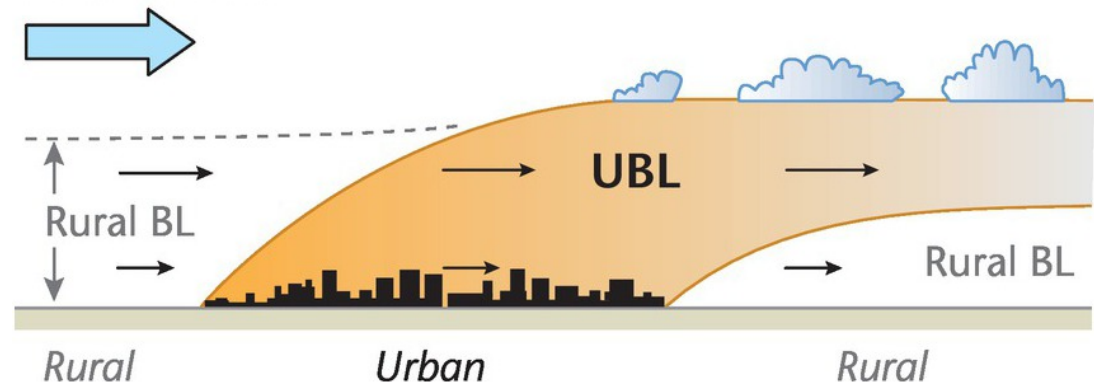
(a) Urban 'dome'

No ambient wind



(b) Urban 'plume'

Ambient wind



# 5. Îlot de chaleur urbain (UHI)

## Impact sur les précipitations...

La ville impacte aussi les précipitations via les aérosols qui sont émis.

AGU PUBLICATIONS

Journal of Geophysical Research: Atmospheres

### RESEARCH ARTICLE

10.1002/2015JD023753

#### Special Section:

East Asian Study of  
Tropospheric Aerosols and  
Impact on Cloud and  
Precipitation

A case study of urbanization impact on summer precipitation in the Greater Beijing Metropolitan Area: Urban heat island versus aerosol effects

Shi Zhong<sup>1,2</sup>, Yun Qian<sup>2</sup>, Chun Zhao<sup>2</sup>, Ruby Leung<sup>2</sup>, and Xiu-Qun Yang<sup>1</sup>

<sup>1</sup>School of Atmospheric Sciences, Nanjing University, Nanjing, China, <sup>2</sup>Pacific Northwest National Laboratory, Richland, Washington, USA



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DOI: 10.1002/qj.3555

### RESEARCH ARTICLE

Quarterly Journal of the  
Royal Meteorological Society

Urban impacts on the spatiotemporal pattern of short-duration convective precipitation in a coastal city adjacent to a mountain range

Hiroyuki Kusaka<sup>1</sup> | Akifumi Nishi<sup>2</sup> | Mayumi Mizunari<sup>2</sup> | Hitoshi Yokoyama<sup>3</sup>

A ville (Tokyo) ralentit la brise de mer ce qui génère des précipitations plus « tôt ».

## Urban Impact on Precipitation (2-D WRF, 243 Ensemble Members)

