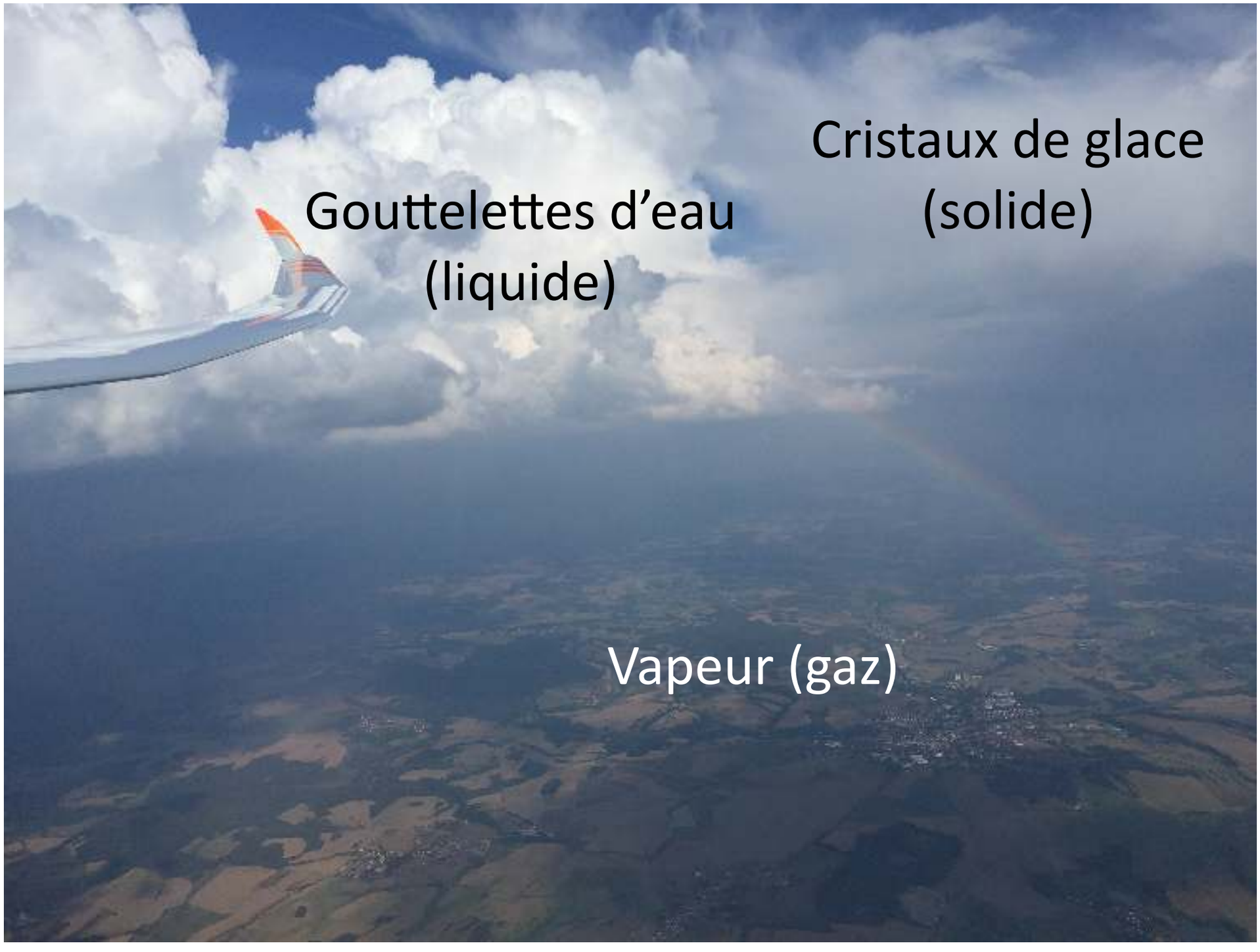
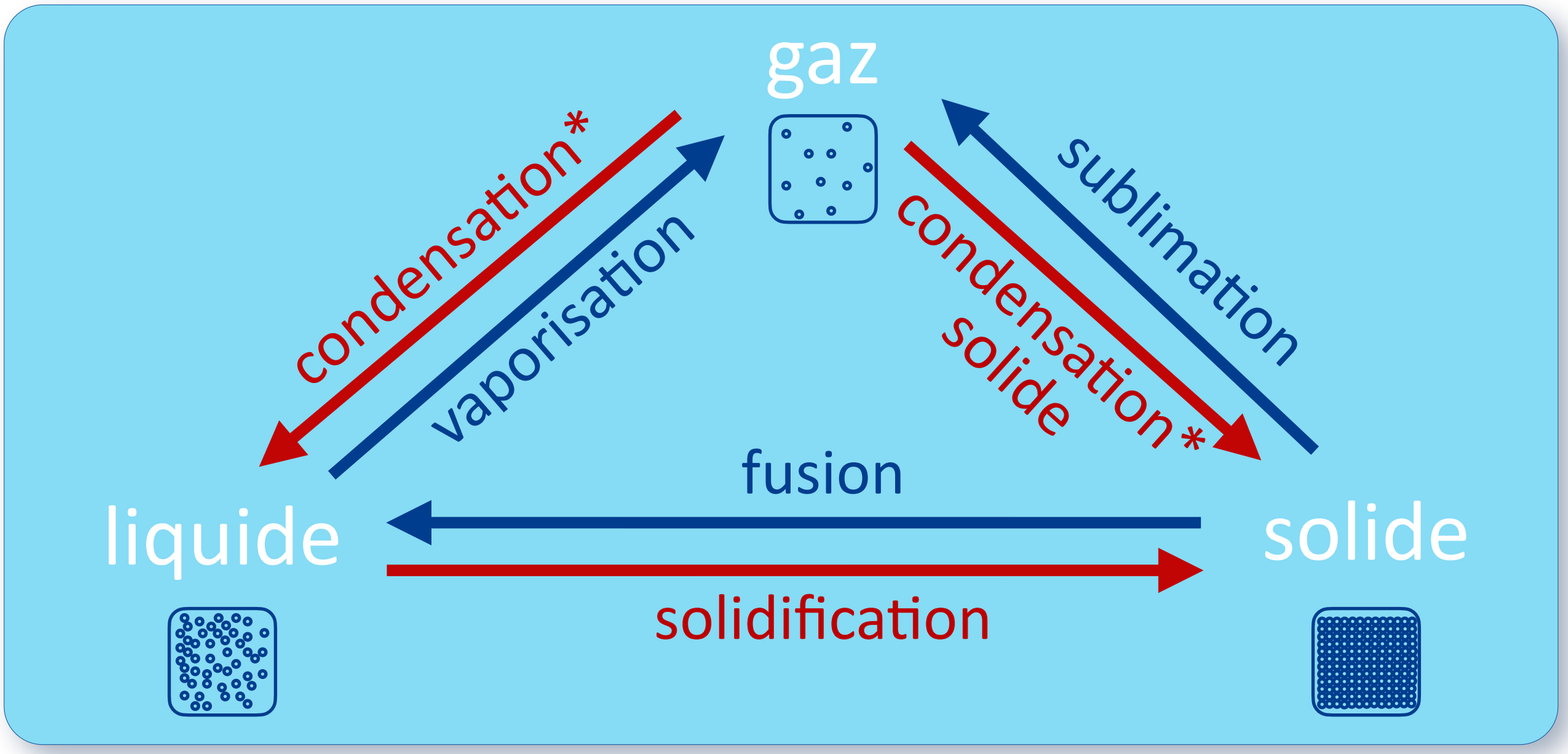
Prévision

1. Atmosphère
2. Vent
3. **Thermodynamique**
4. Nuages
5. Brume et brouillard
6. Précipitations
7. Masses d’air et fronts
8. Climatologie
9. Dangers pour l’aviation
10. Information météorologique

3. Thermodynamique

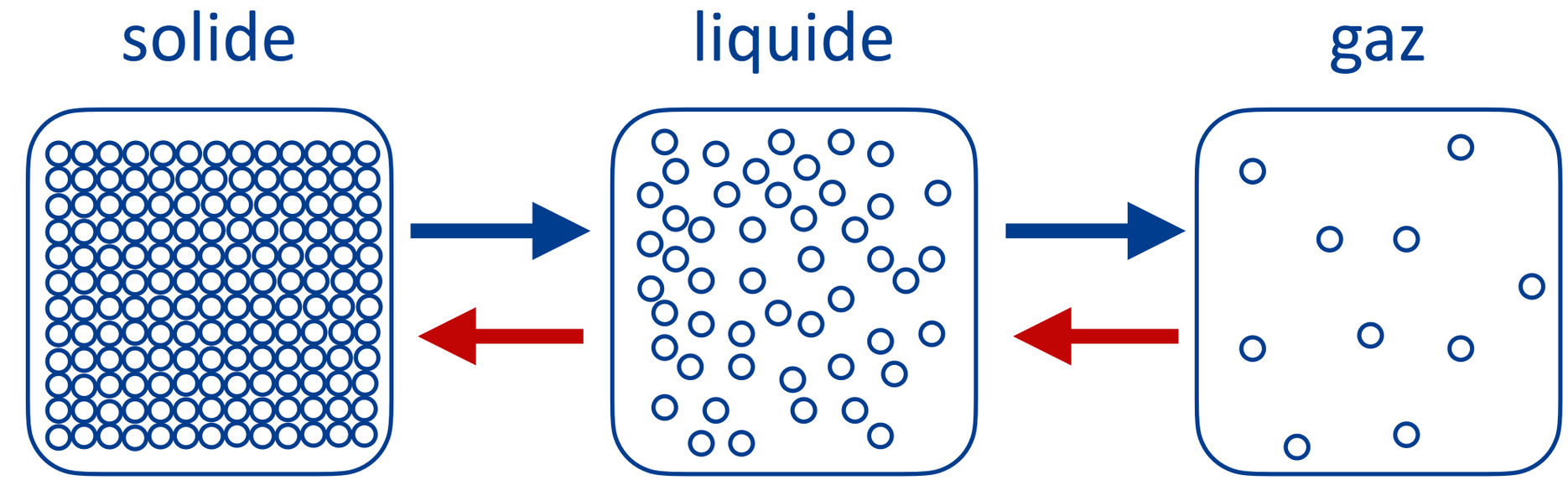


3.1 Changements d'état



*La condensation est la liquéfaction dans le langage courant.

3.1 Changements d’état

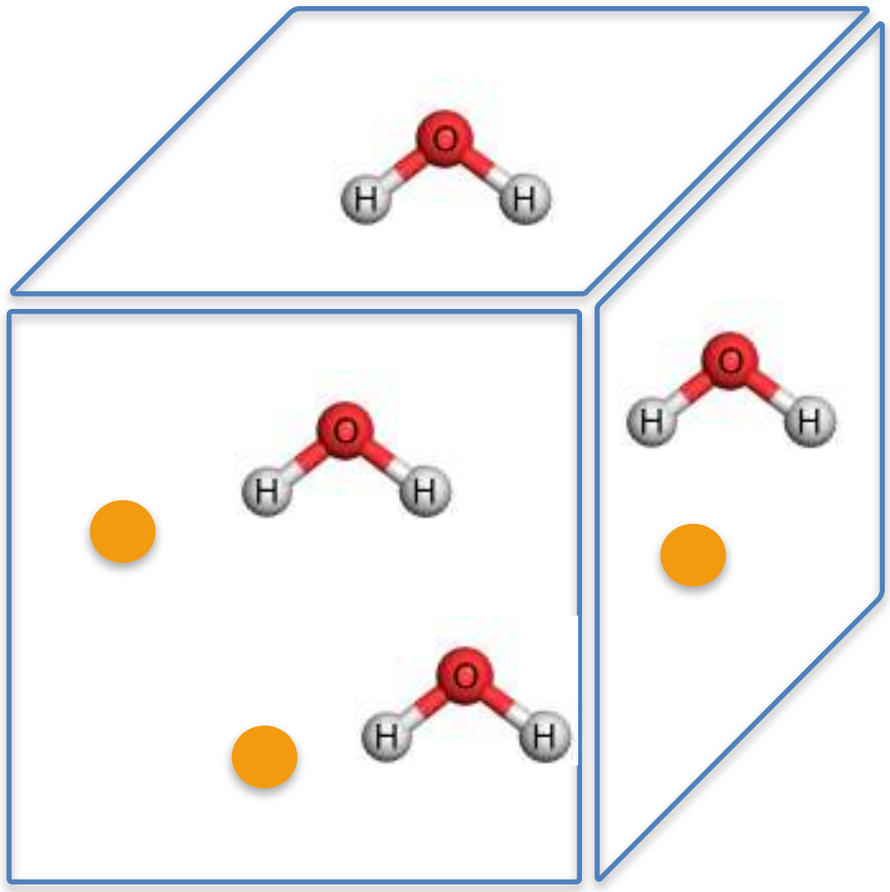


nécessite de l’énergie
prélève de l’énergie au milieu

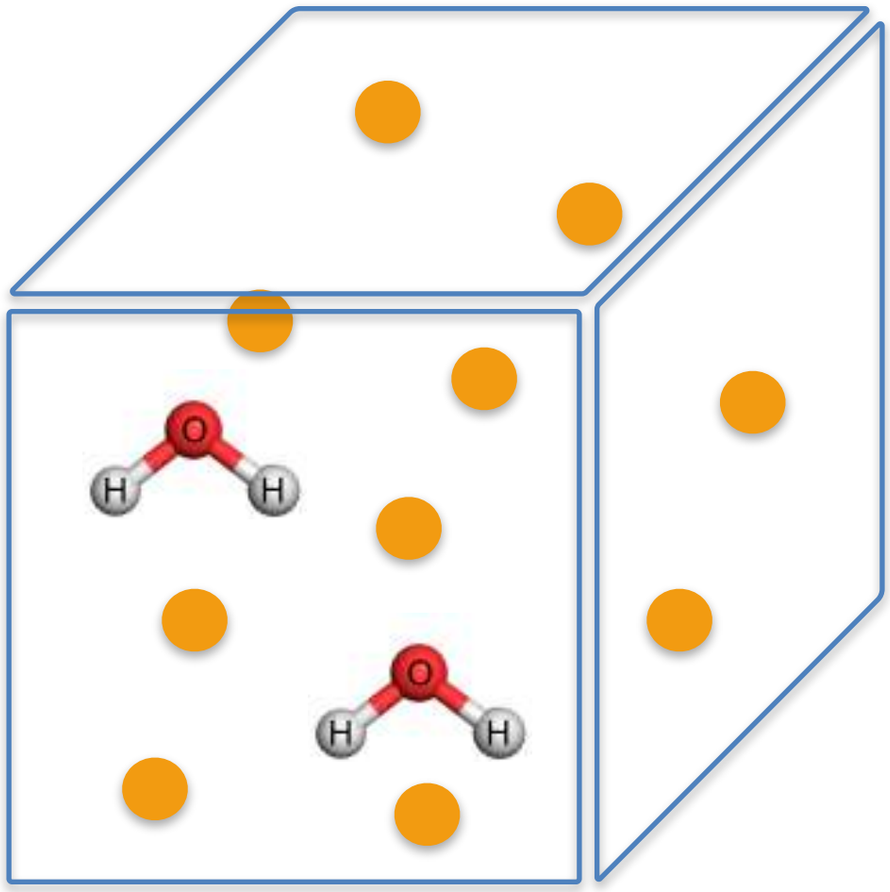
libère de l’énergie dans le milieu

3.2 Humidité

Humidité absolue : masse de vapeur d'eau en g/m³ d'air sec

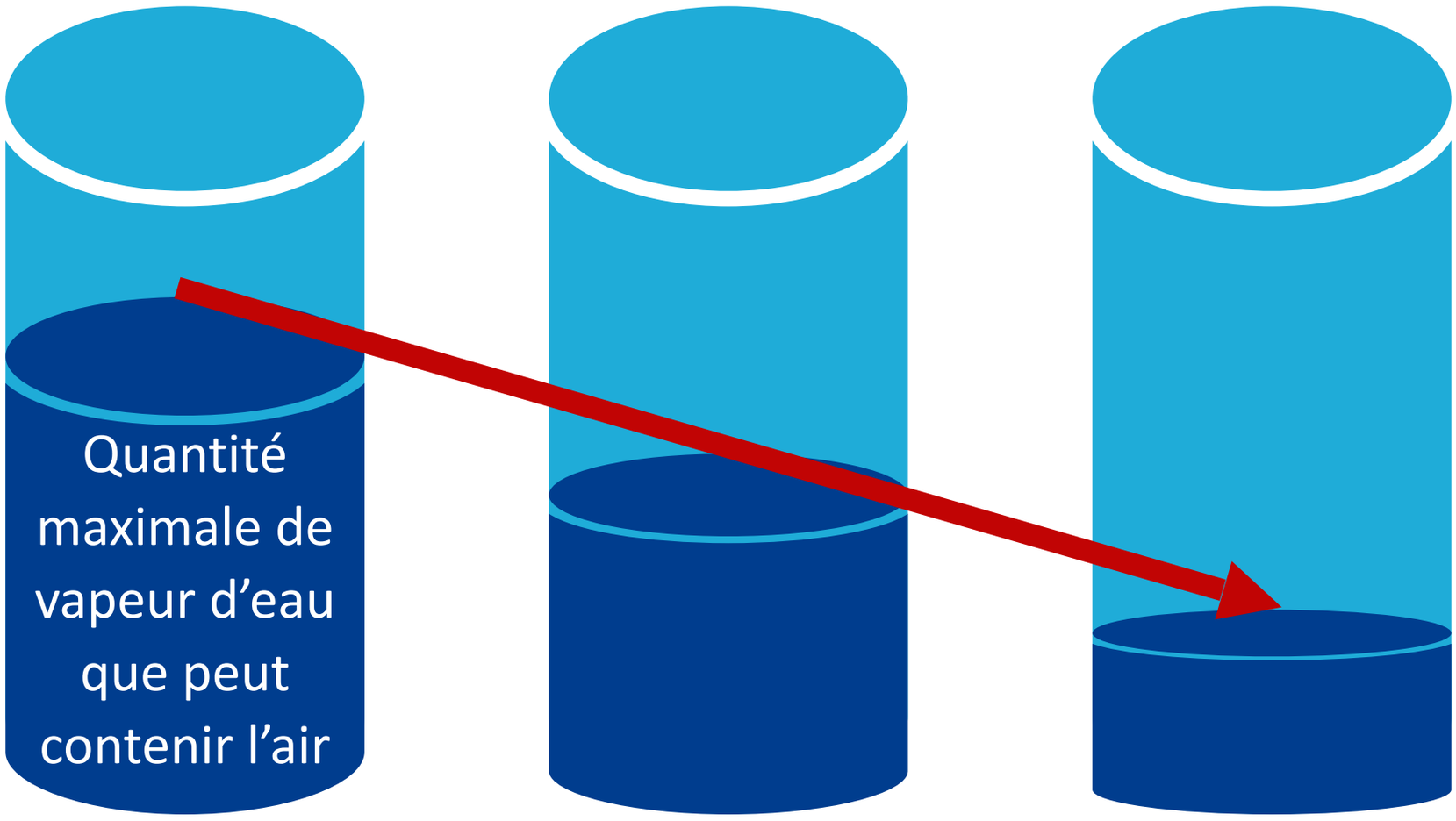


Air chaud



Air froid

3.2 Humidité


Quantité maximale de vapeur d’eau que peut contenir l’air
30 °C
20 °C
10 °C

3.2 Humidité

Humidité **relative***

$$\text{Humidité relative (\%)} = \frac{\text{Vapeur d'eau}}{\text{Vapeur d'eau à saturation}}$$

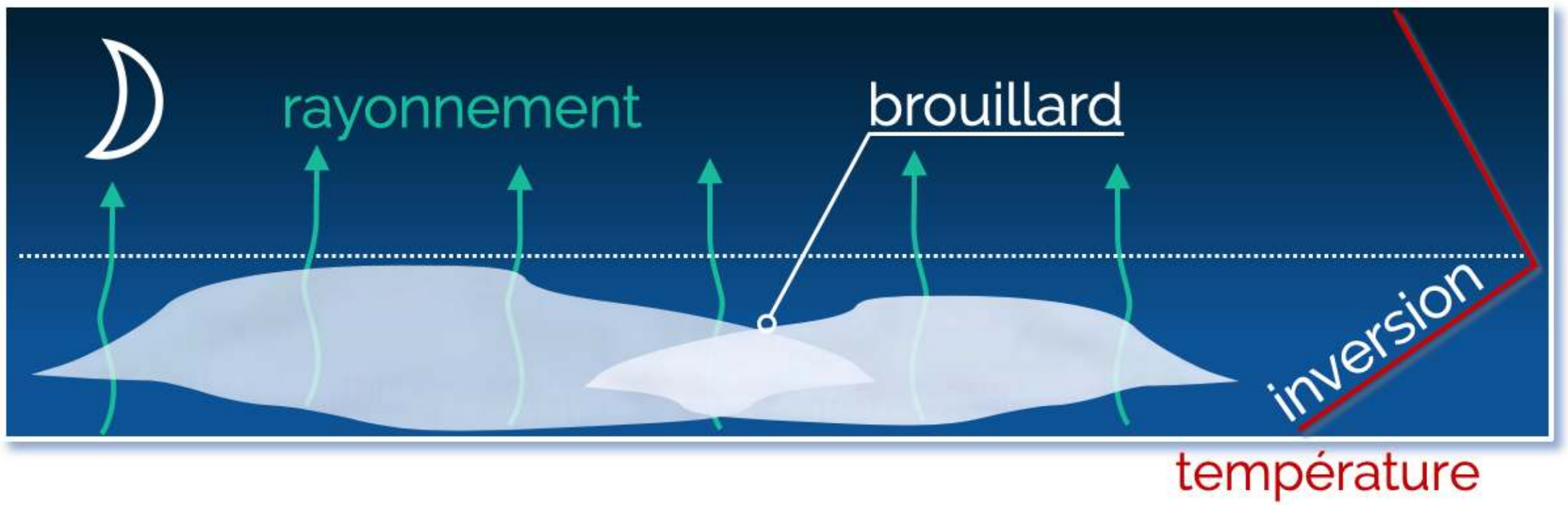
Point de rosée* (T_d) : température à laquelle se produit la saturation (HR 100 %)

Saturation : refroidir l'air ou apporter de la vapeur d'eau

1) Refroidissement à pression constante = isobare*
2) Refroidissement par détente*

3.2 Humidité

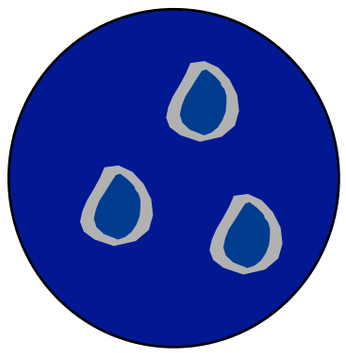
Refroidissement **isobare**



3.2 Humidité

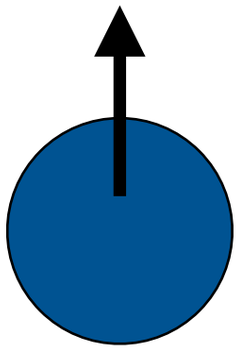
Refroidissement **par détente**

T = 10 °C



HR = 100 % ⟶ T_d = 10 °C

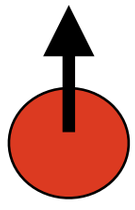
T = 15 °C



HR = 80 %

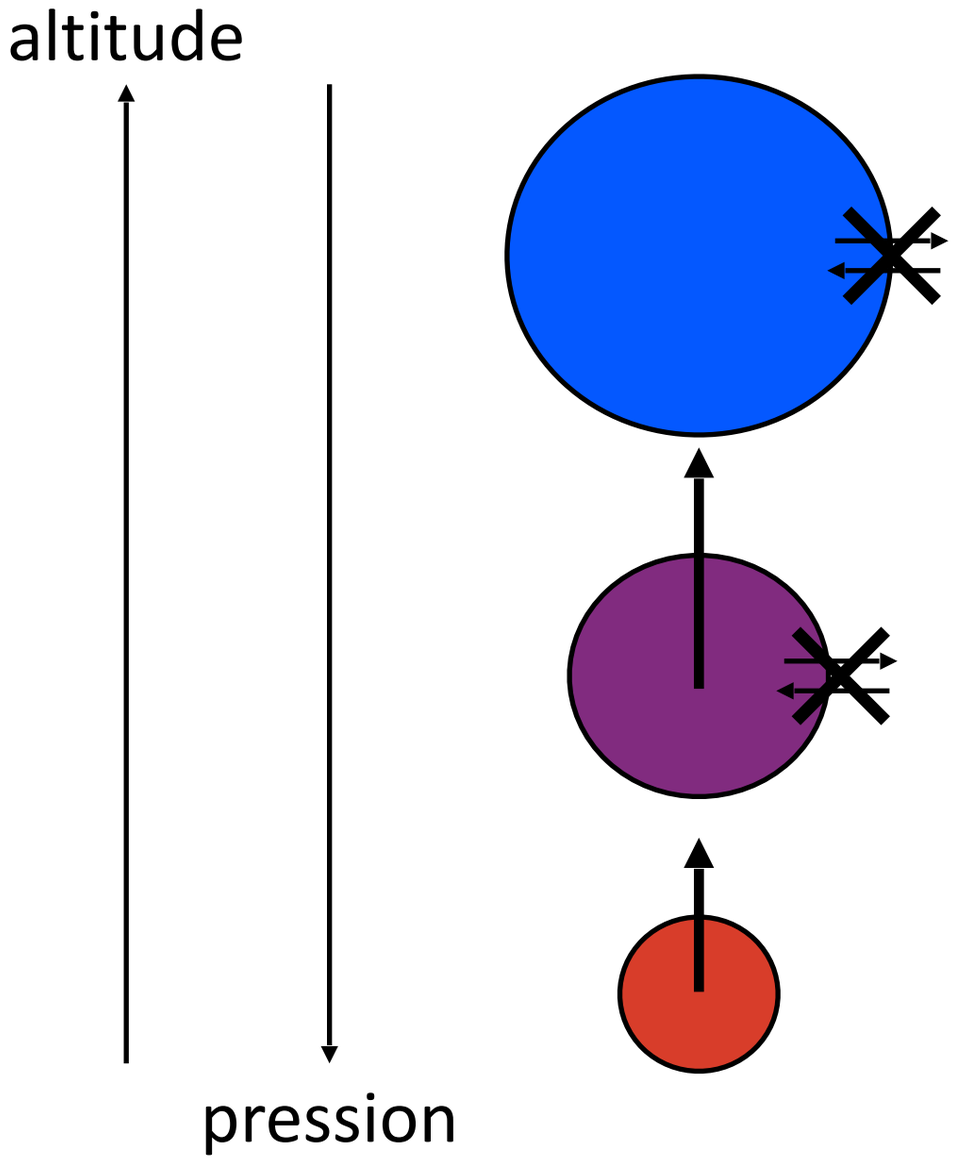
$$HR\ (\%) = \frac{Vapeur\ d'eau}{Vapeur\ d'eau\ à\ saturation}$$

T = 20 °C



HR = 60 %

3.3 Transformation adiabatique

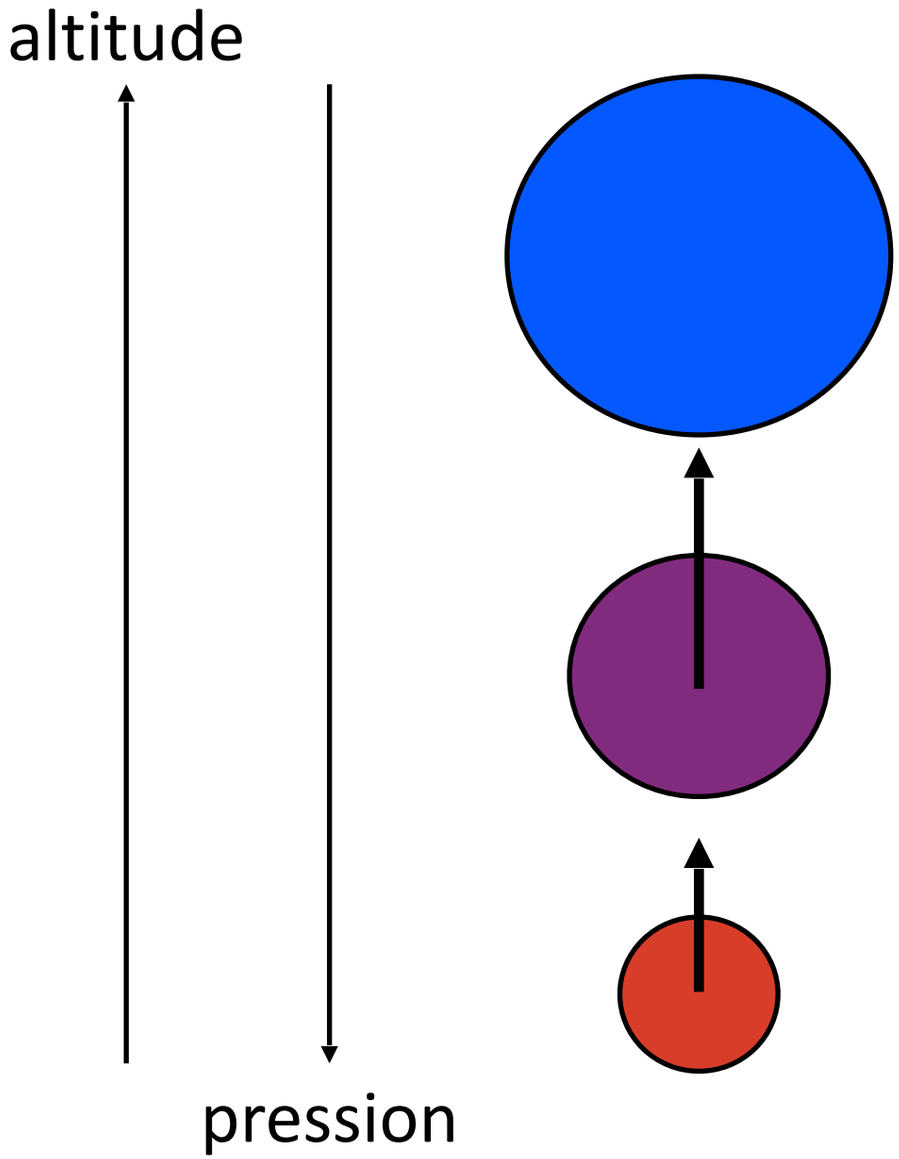


Air mauvais conducteur de la chaleur

↓

Transformation **ADIABATIQUE**

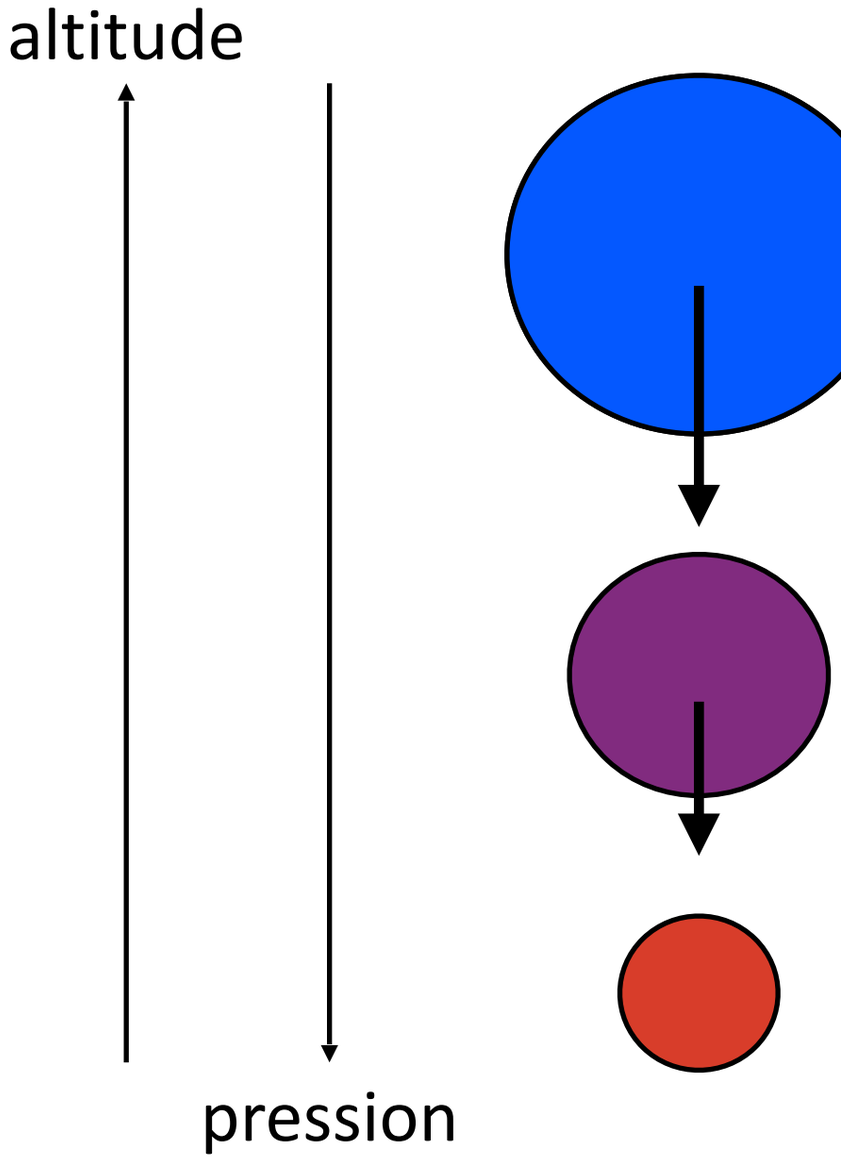
3.3 Transformation adiabatique



Refroidissement par **DÉTENTE** ADIABATIQUE

- augmentation volume
- baisse de température

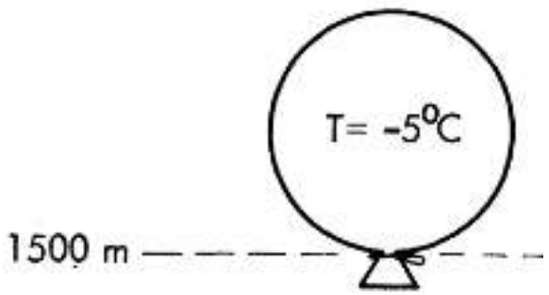
3.3 Transformation adiabatique

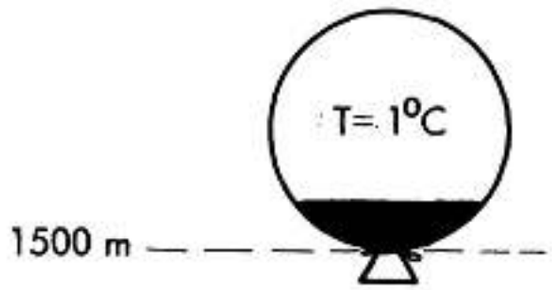


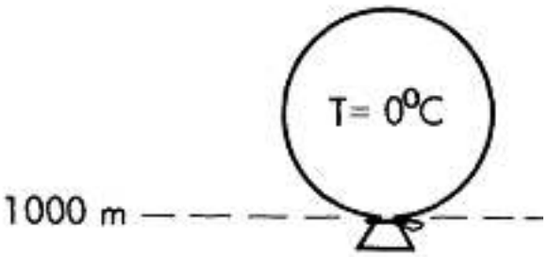
Réchauffement par
COMPRESSION ADIABATIQUE

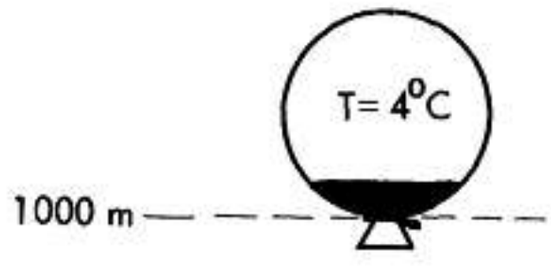
- diminution volume
- hausse de température

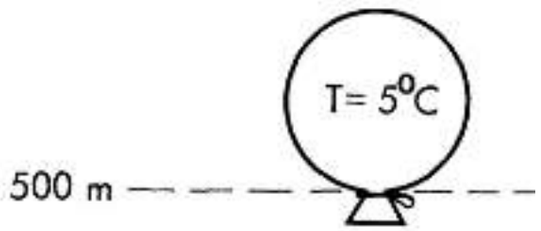
3.3 Transformation adiabatique

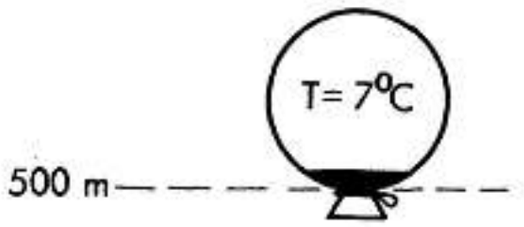


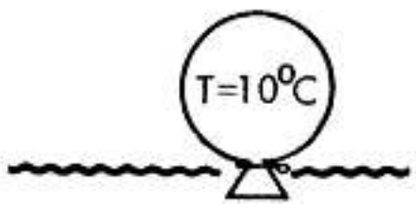




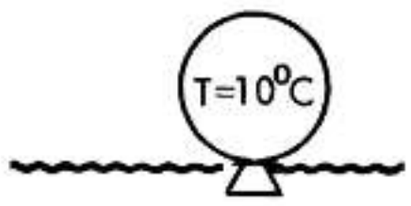






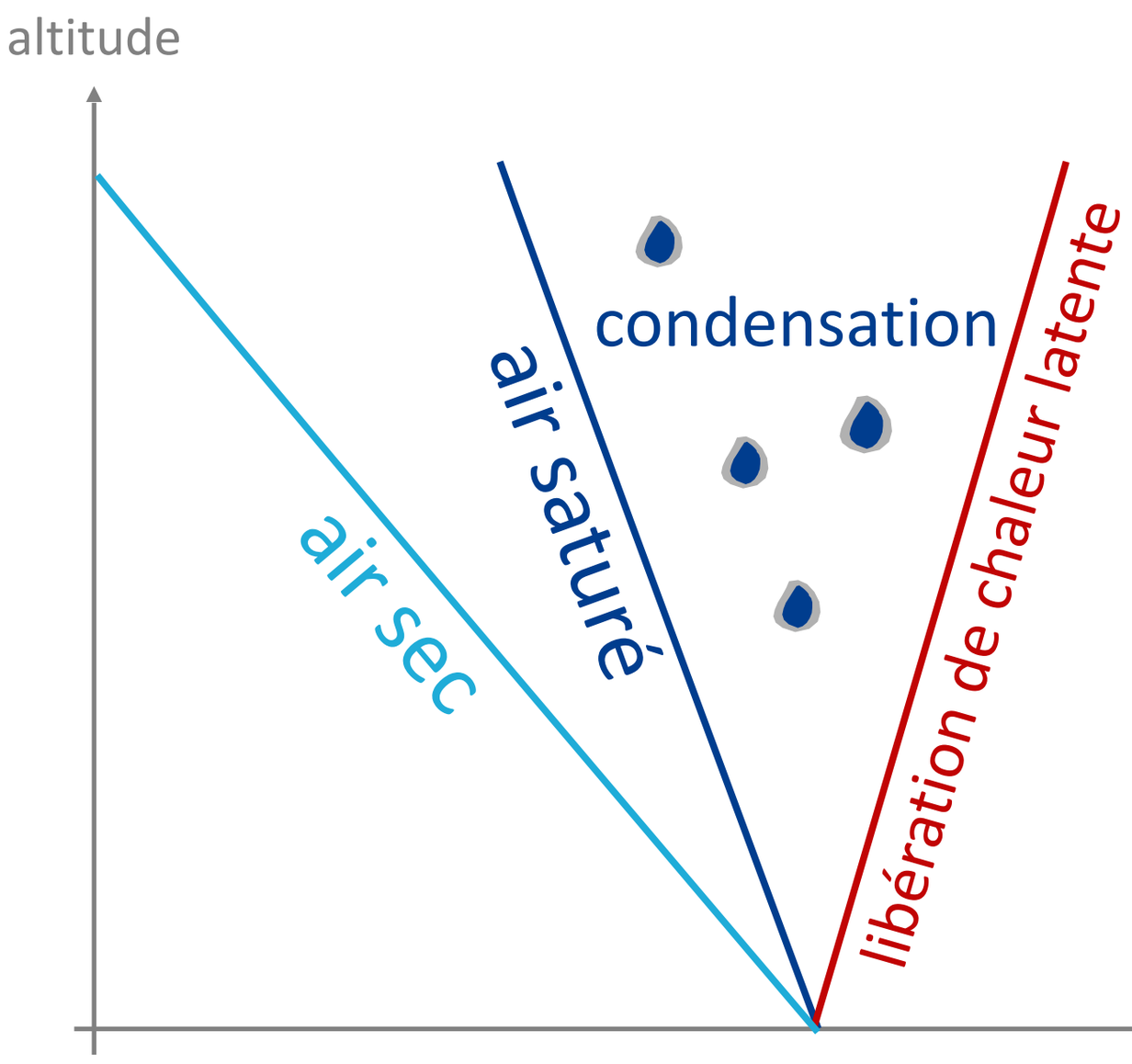


Air sec



Air saturé

3.3 Transformation adiabatique



-1 °C/100 m

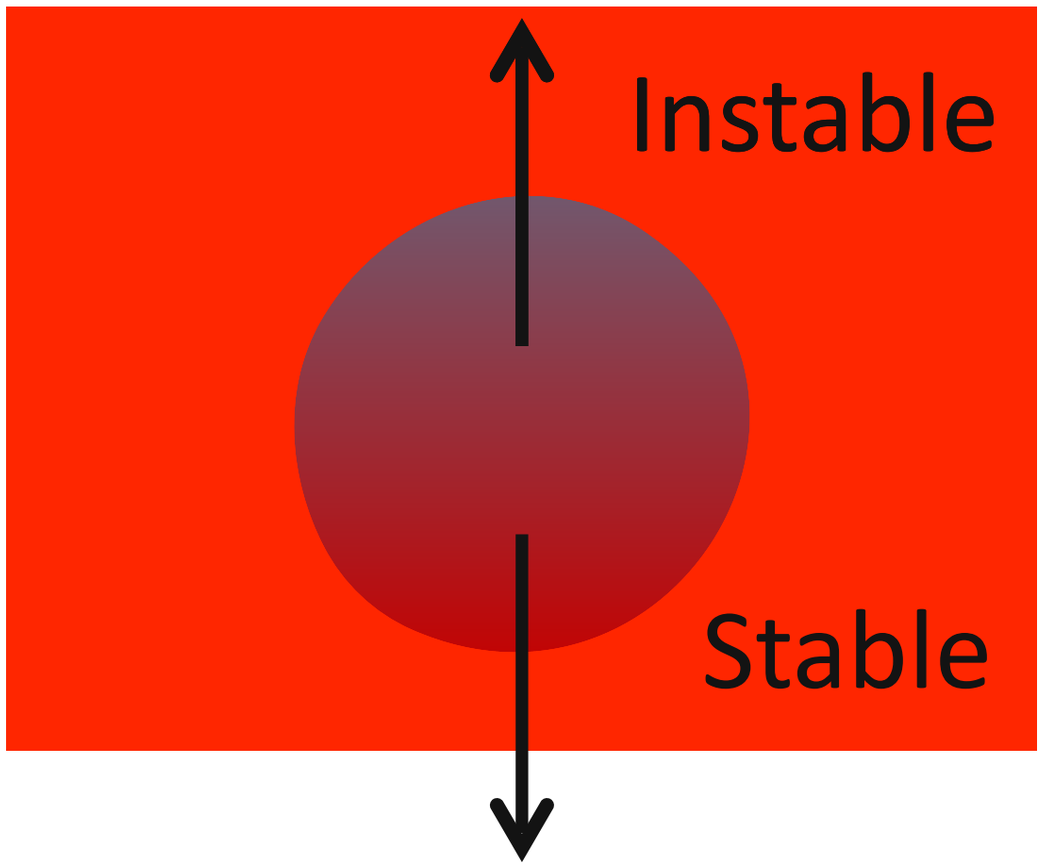
-0,6 °C/100 m

3.3 Transformation adiabatique

Gradients adiabatiques		Profil vertical T
Air sec	**Air saturé**	**ISA**
1°C / 100 m	~ 0,6°C / 100 m	0,65°C / 100 m

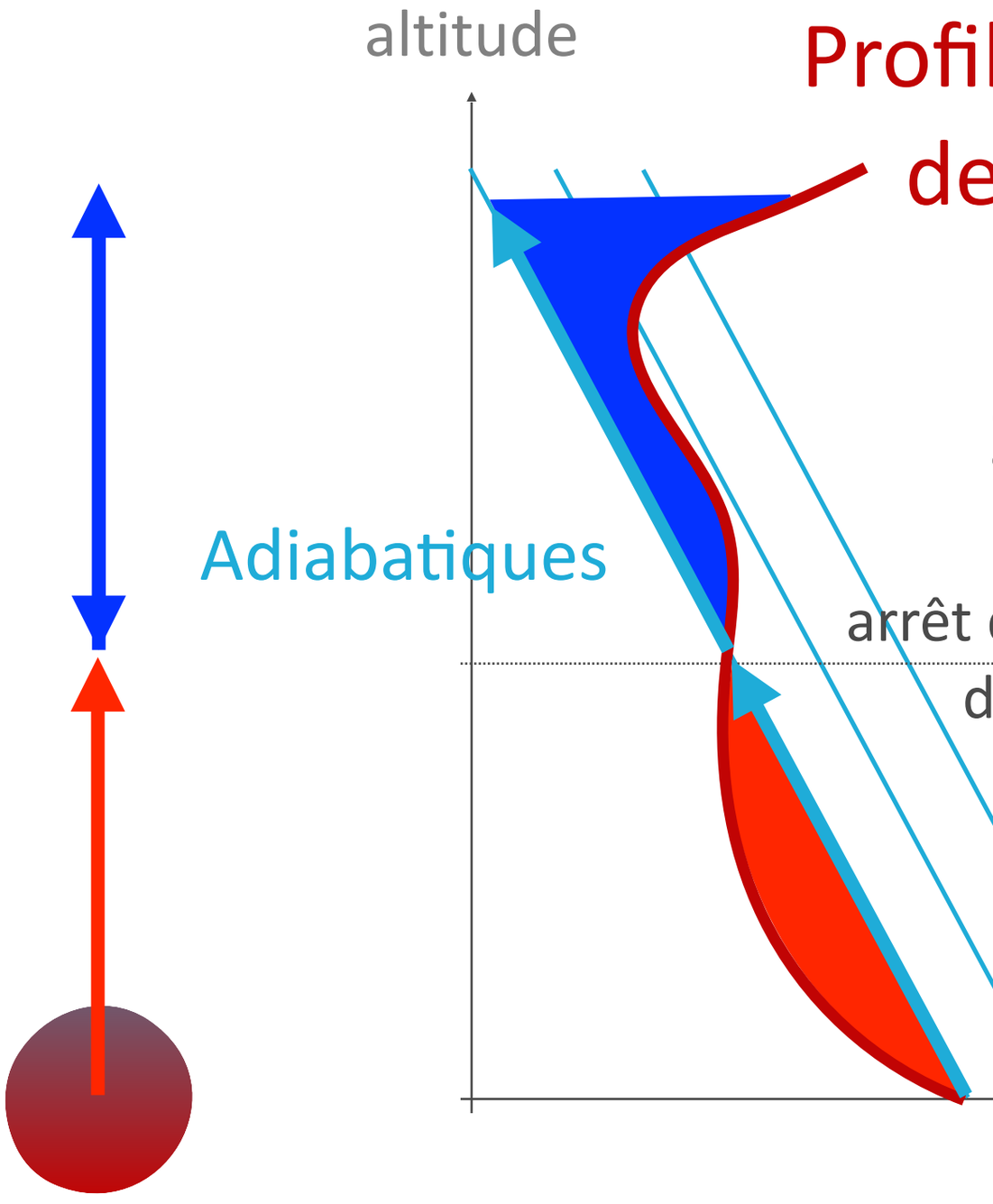
3.3 Transformation adiabatique

Devenir de la bulle d’air?



- Profil de température
- Humidité

3.4 Stabilité/instabilité



Stable

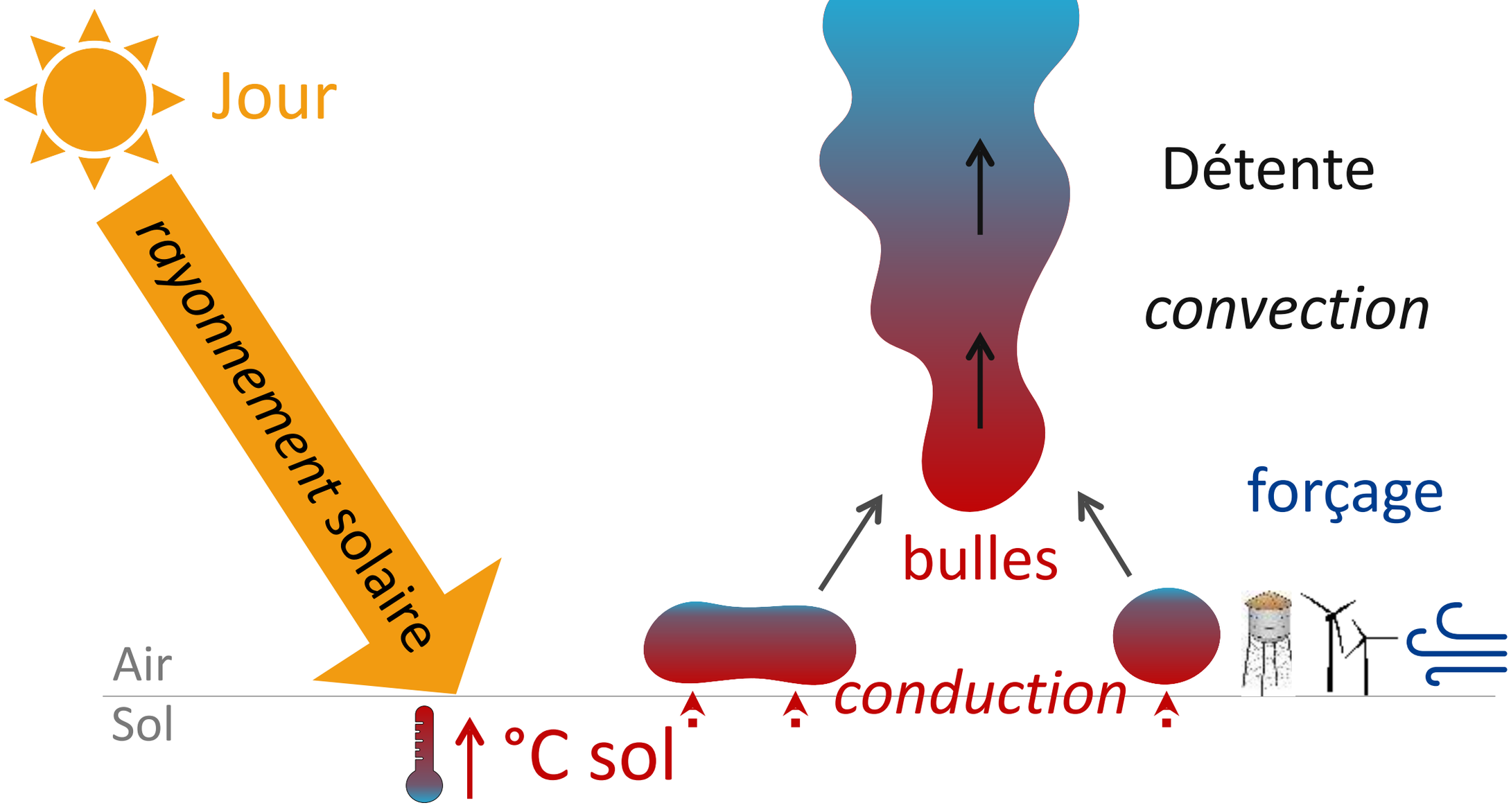
Pas de mouvements verticaux spontanés

Instable

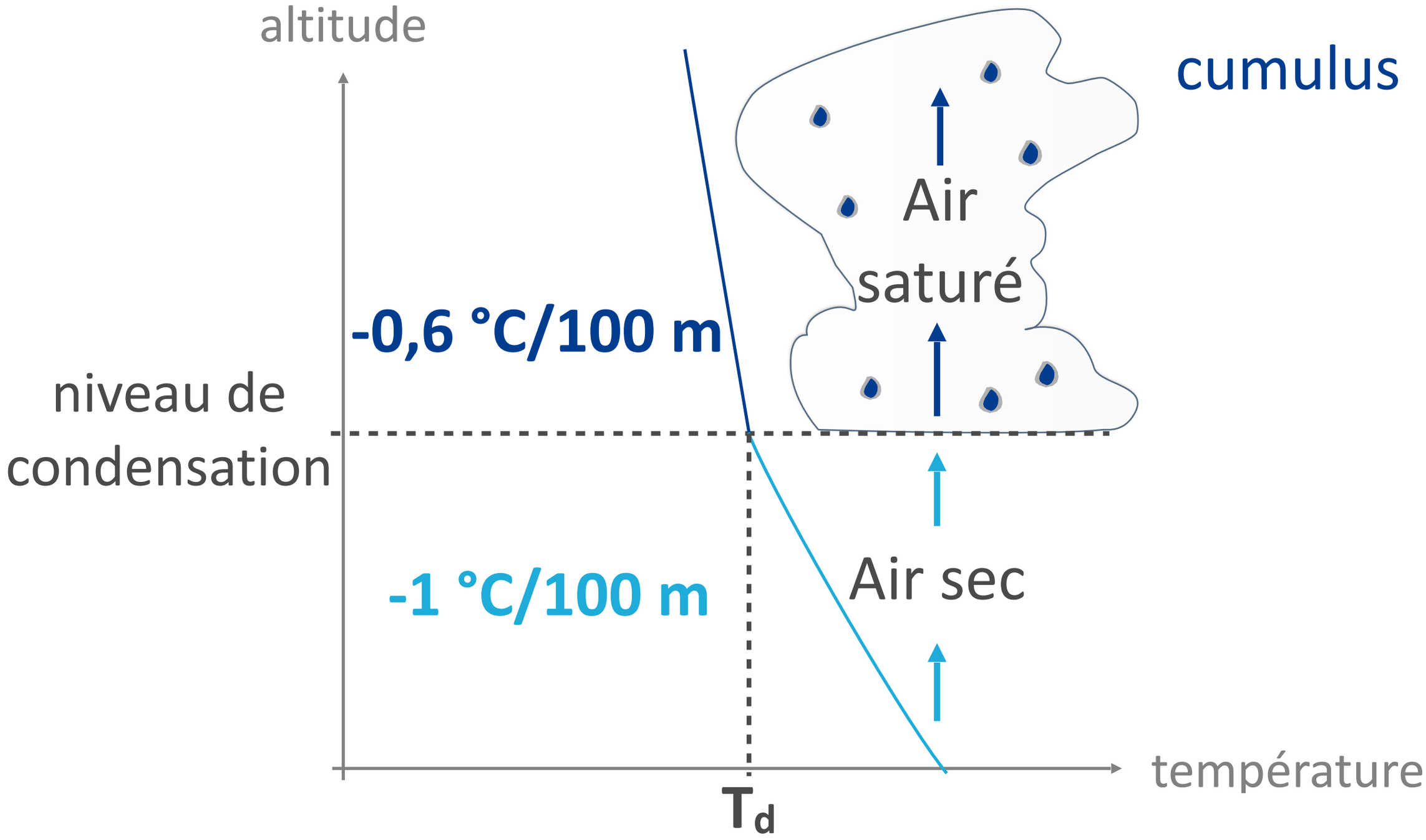
Convection
Ascendances

3.5 Convection

Le moteur : énergie solaire



3.5 Convection



3.5 Convection

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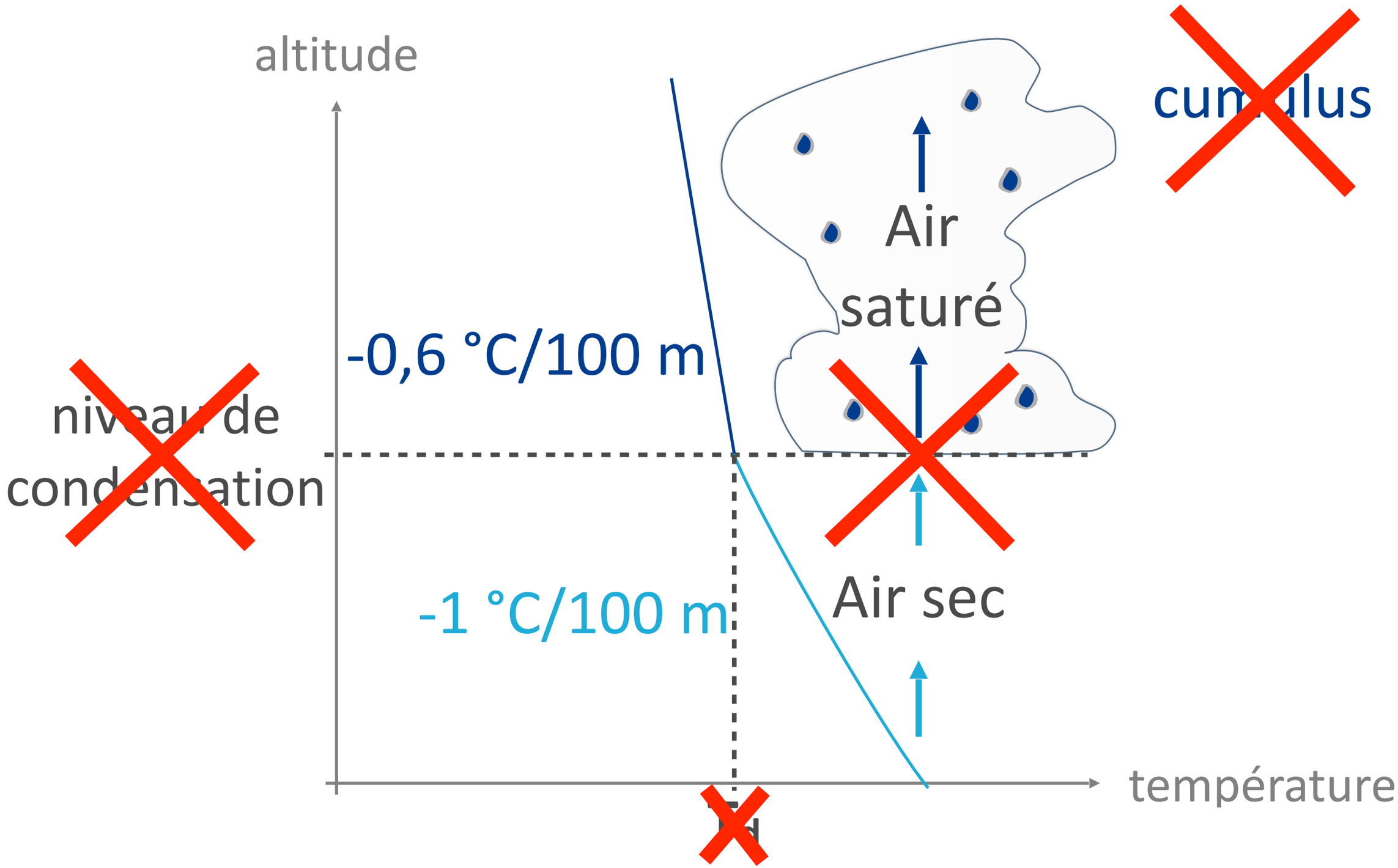
Sans cumulus, pas d’ascendances?

3.5 Convection



3.5 Convection

Repérage des ascendances

Quand matérialisées :

➡ Observer le ciel

3.5 Convection

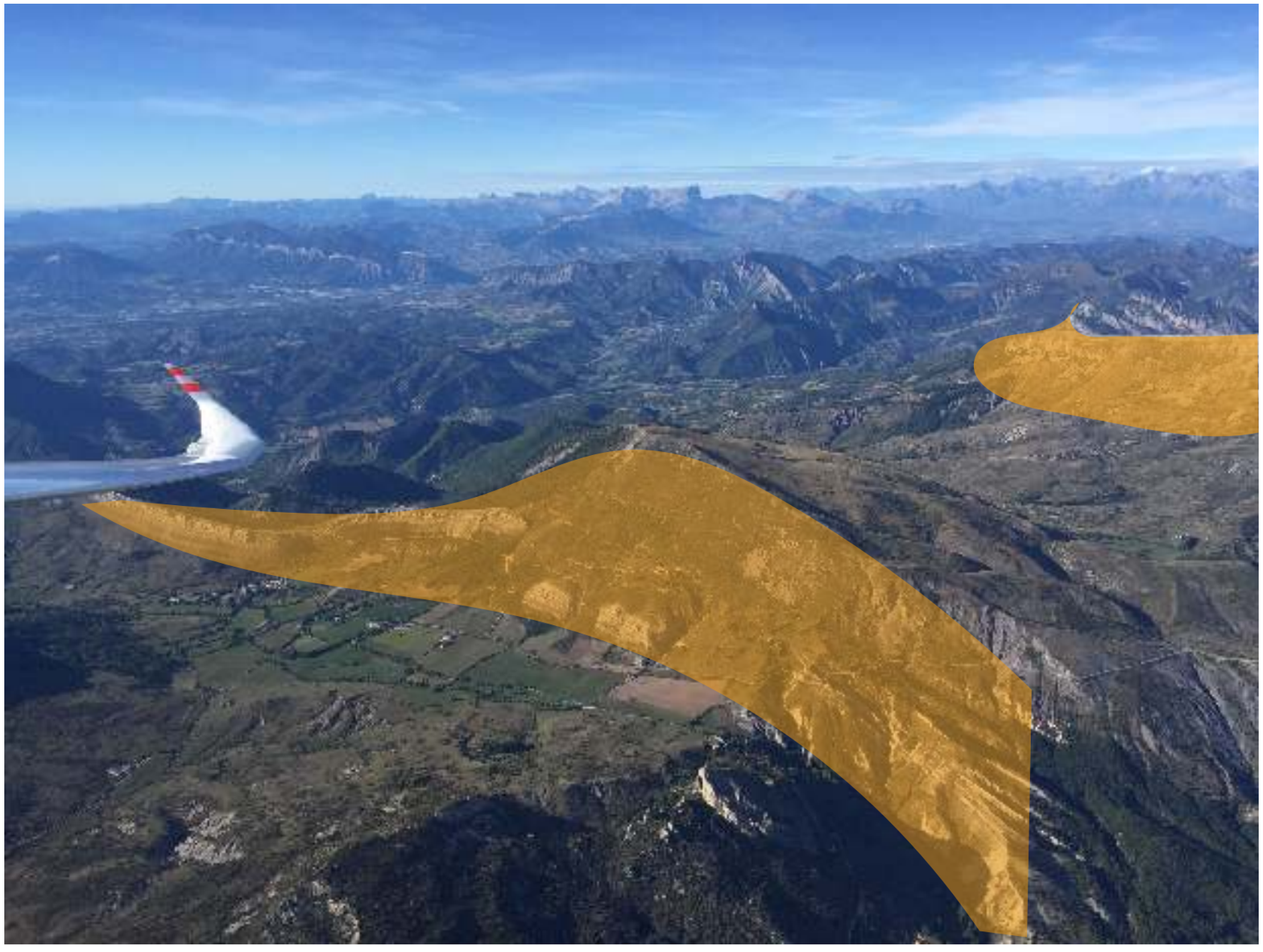
Repérage des ascendances

Quand matérialisées :

- ➡ Observer le ciel
- ➡ Forme du cumulus renseigne sur cycle de vie de l’ascendance

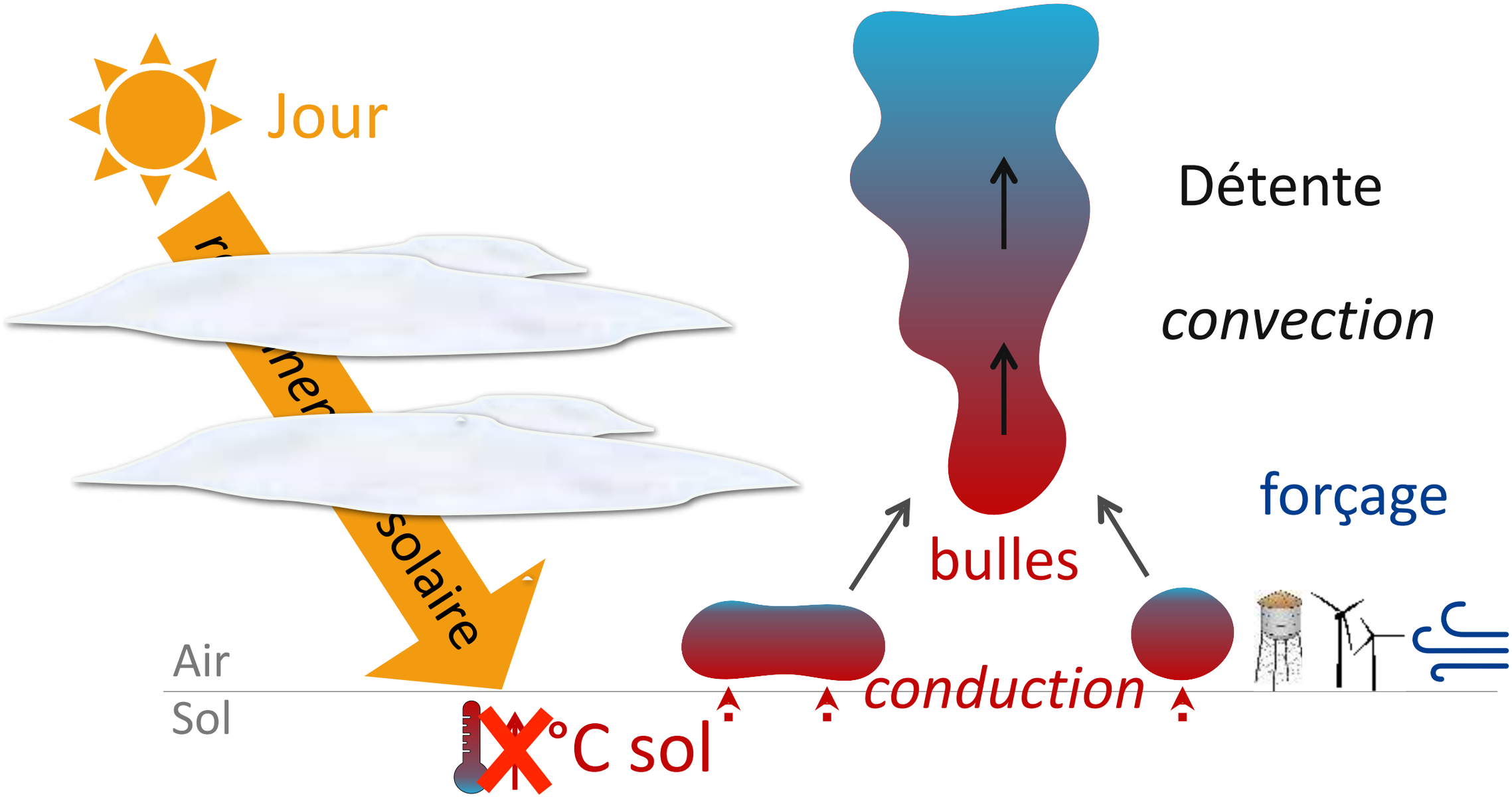
3.5 Convection

En thermique pur : Observer le sol et le relief



3.5 Convection

Facteurs limitant la convection



3.5 Convection

Facteurs limitant la convection

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Facteurs limitant la convection

Questions

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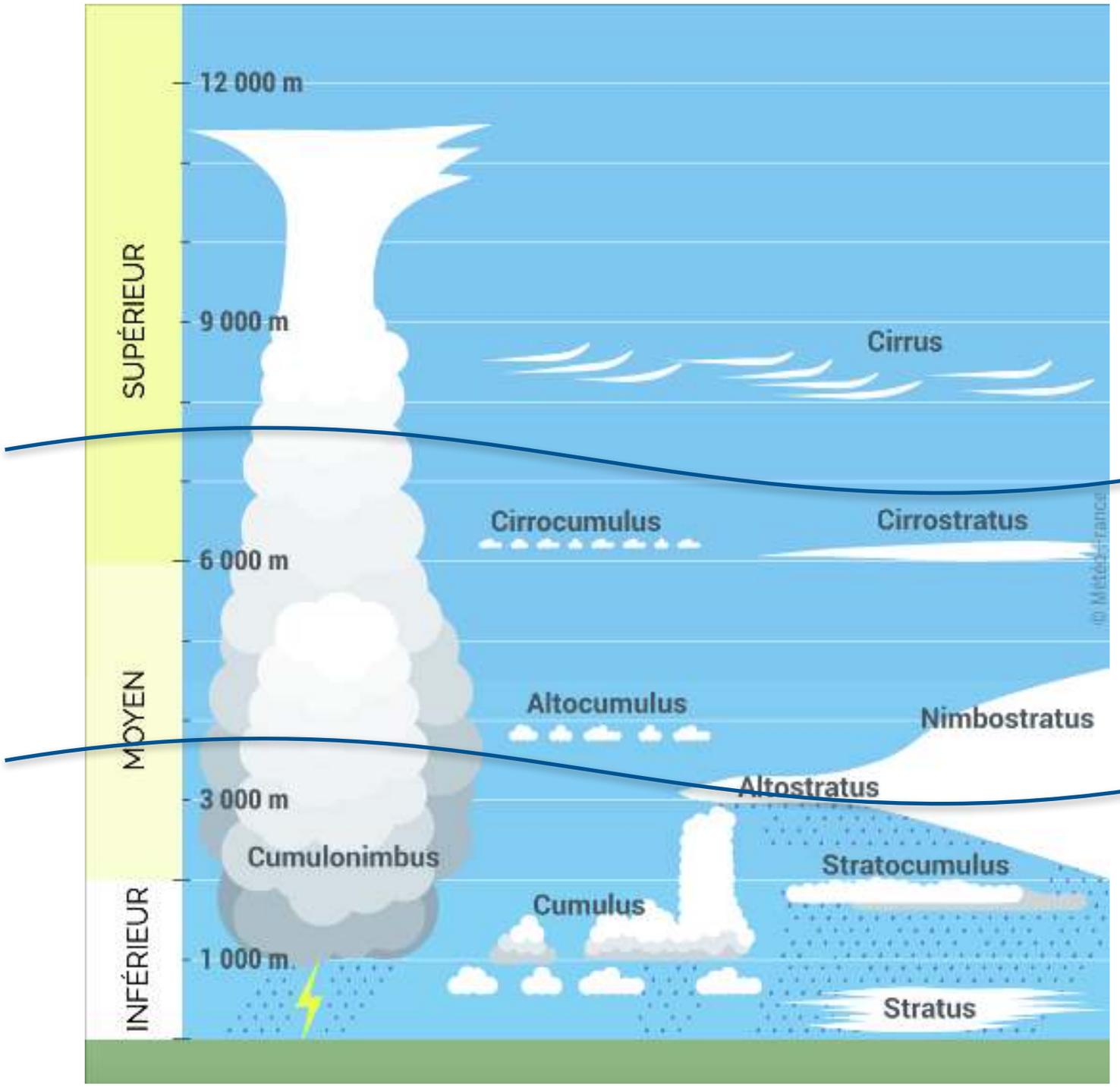
4. Nuages

4.1 Composition



-15 °C

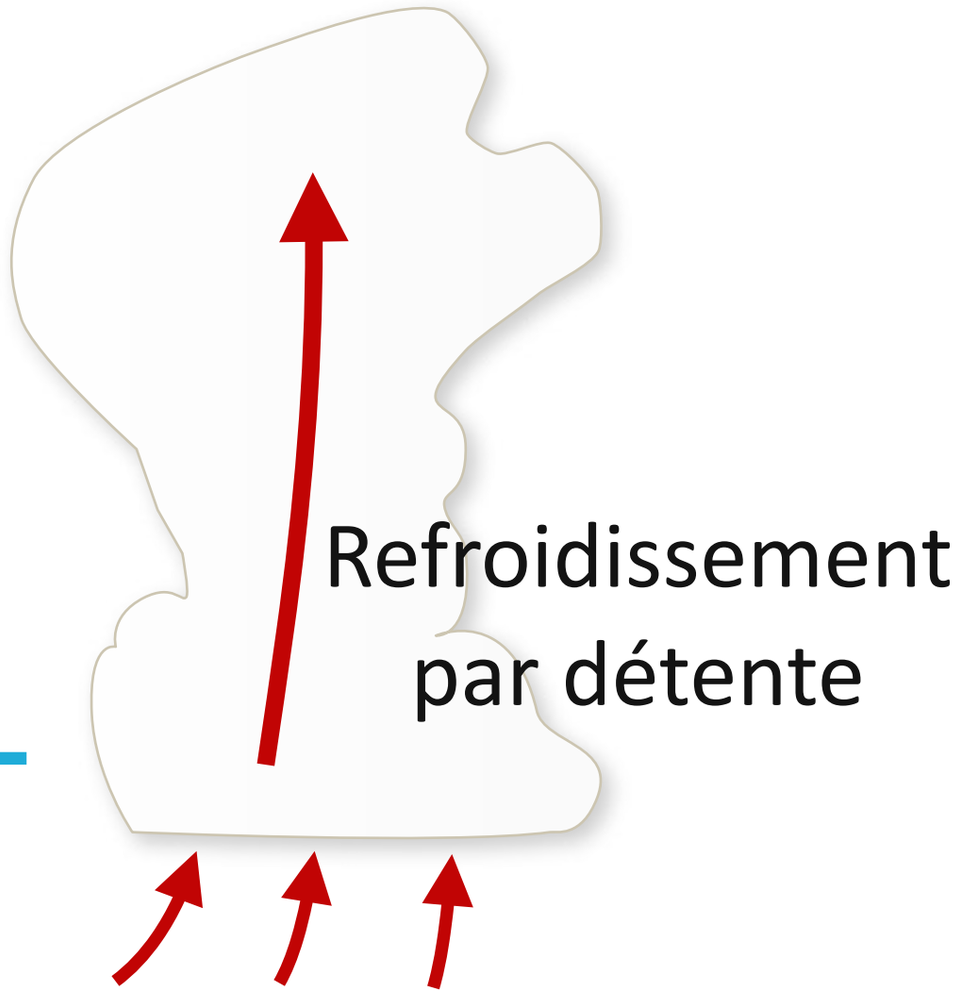
0 °C

4.2 Formation

Refroidissement isobare

Nuage **stratiforme**

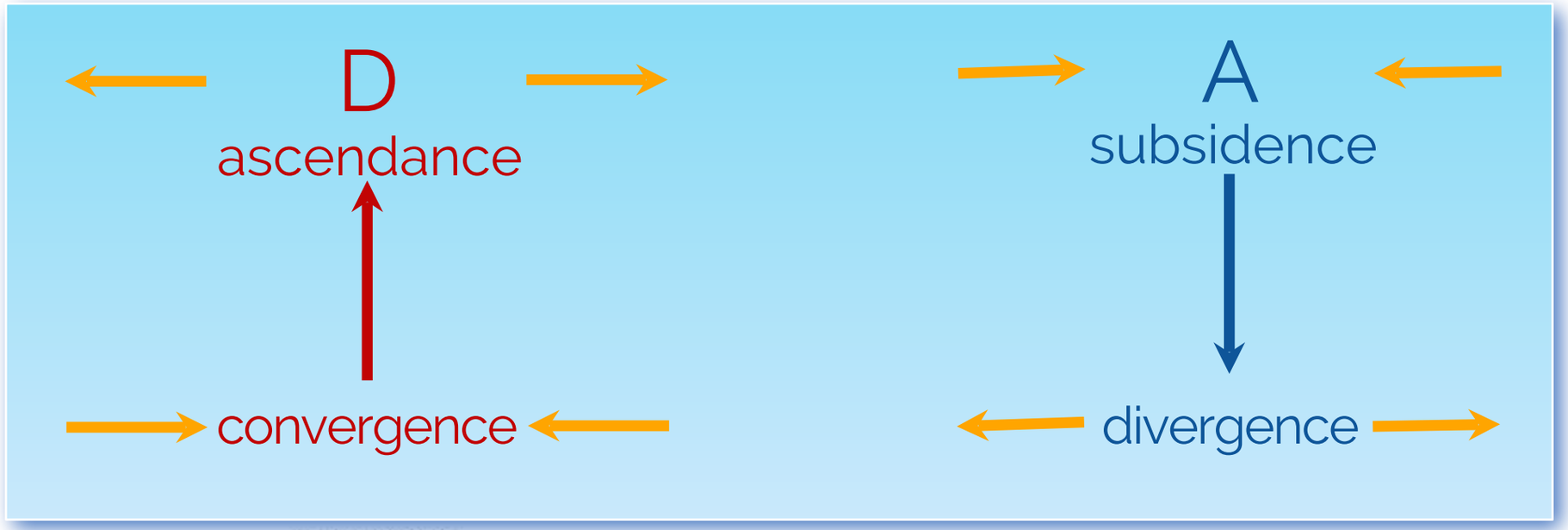
Advection humide

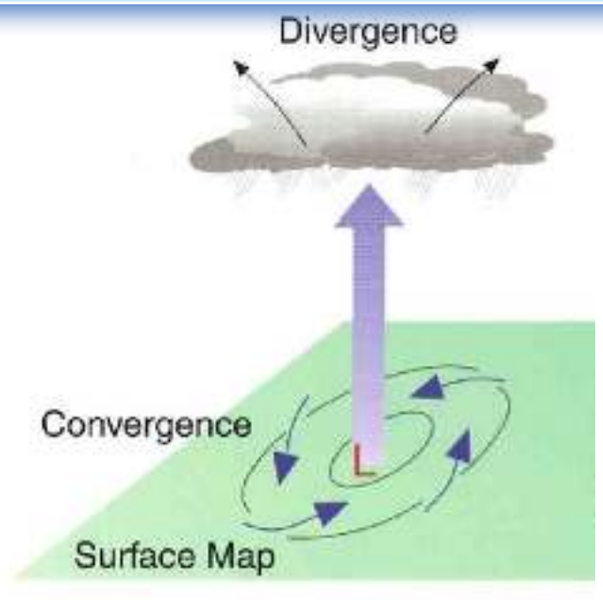


Nuage **convectif**

4.2 Formation

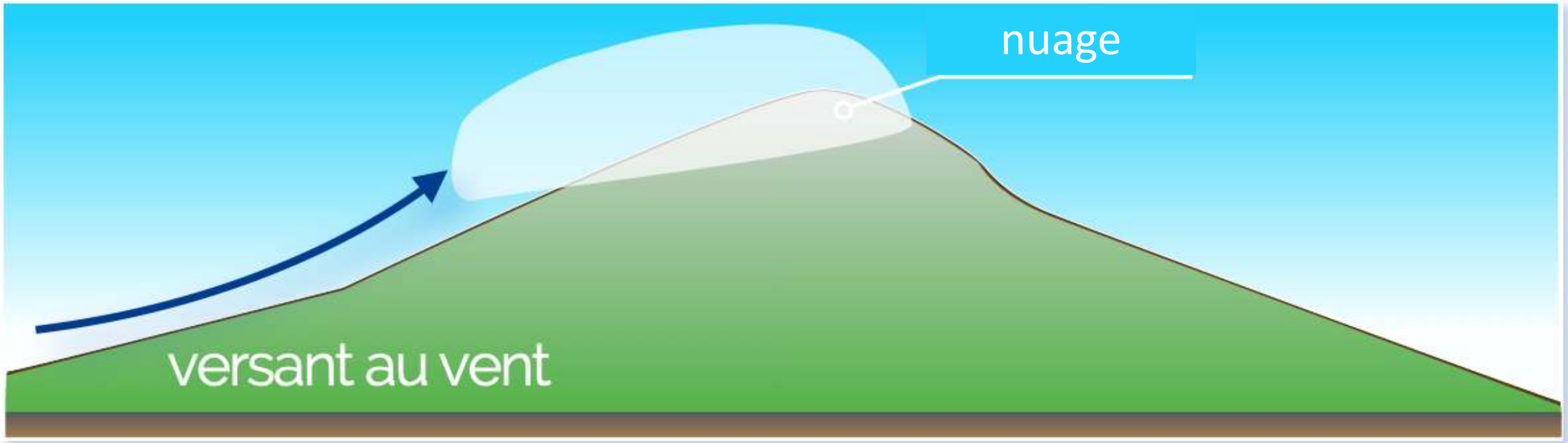
Soulèvement de grande échelle (dépression)





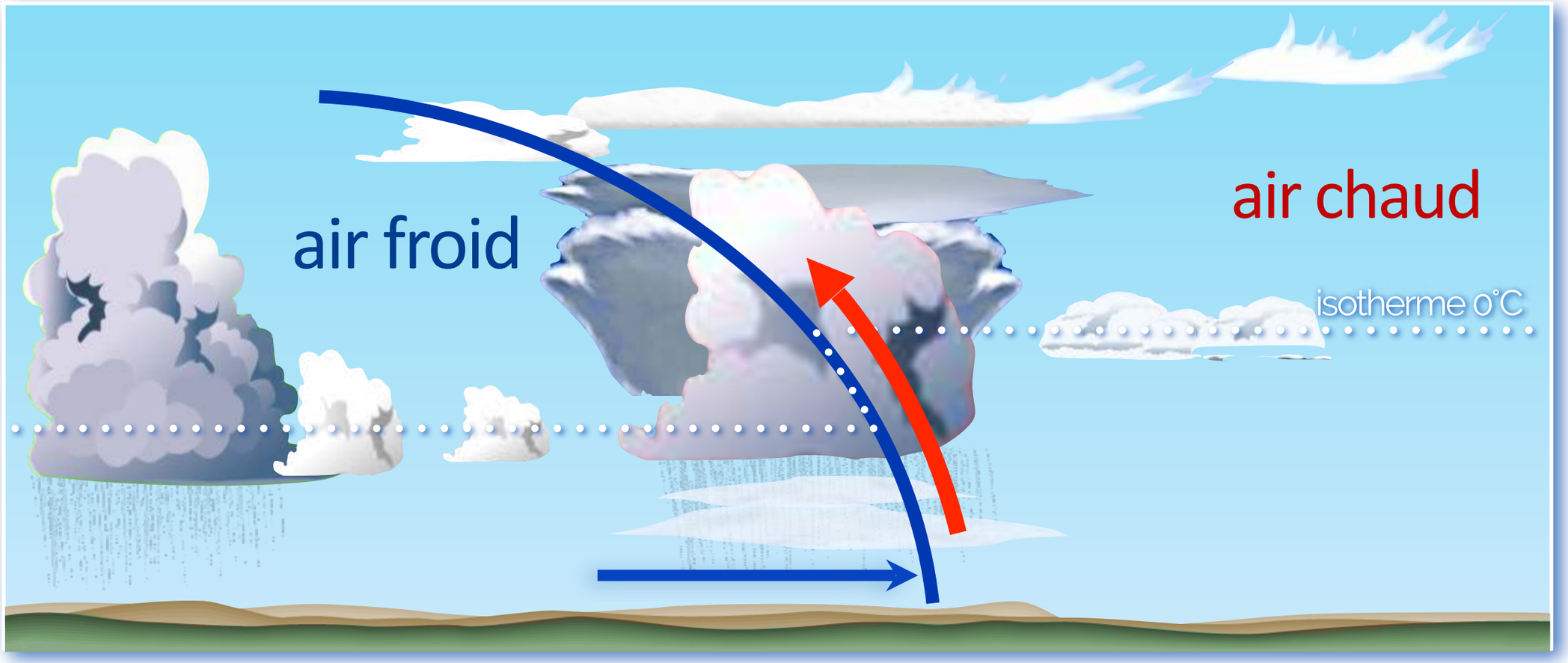
4.2 Formation

Soulèvement orographique

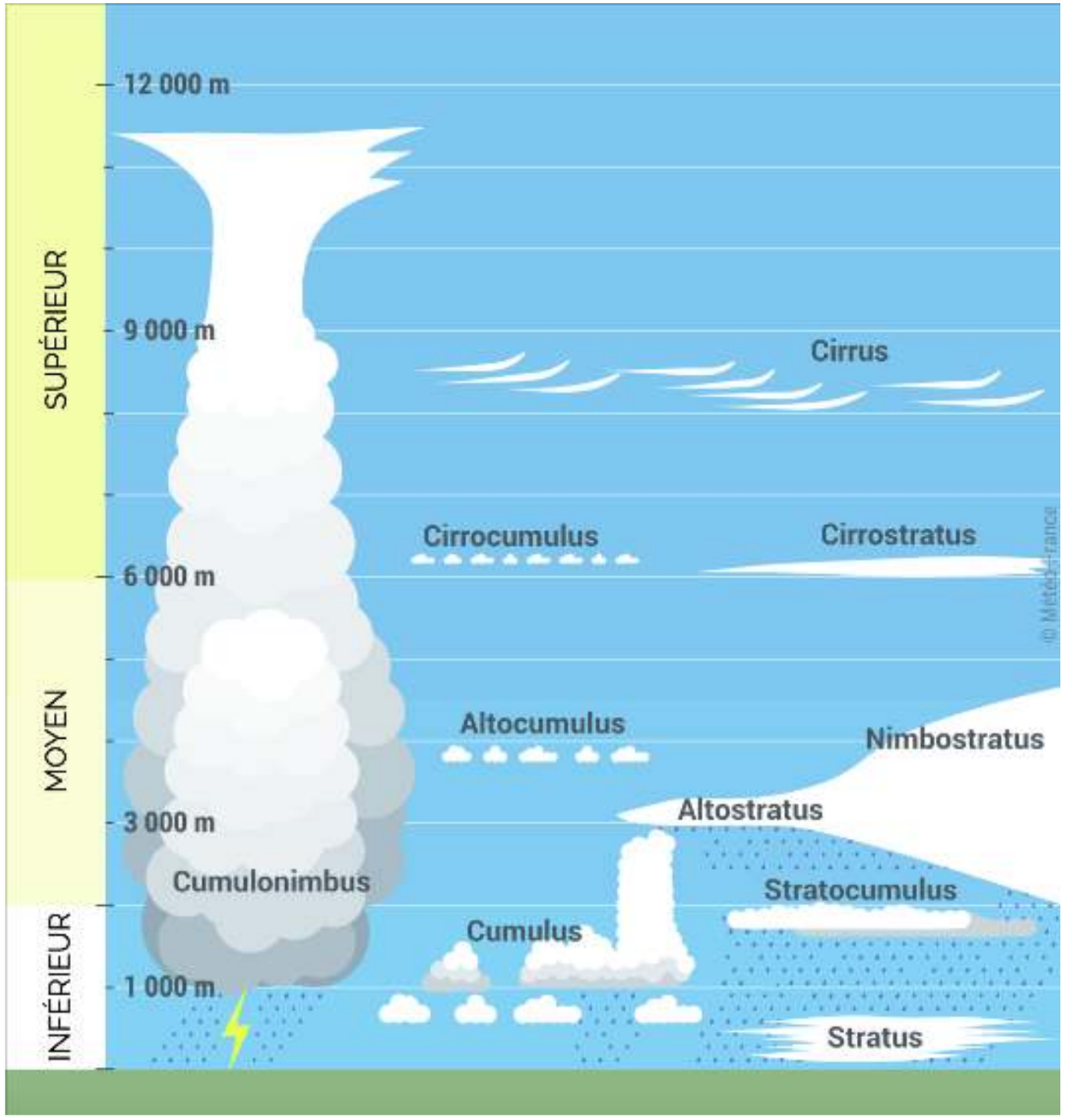


4.2 Formation

Soulèvement frontal



4.3 Genres de nuages



4.3 Genres de nuages

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Stratocumulus Sc

4.3 Genres de nuages

Nimbostratus Ns

4.3 Genres de nuages

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