MOUNTAIN FLYING

as compared to flatland soaring.

The purpose of this seminar is to emphasise the differences between these two flight environments.

The seminar is especially aimed at Junior Pilots, coming to Rieti for the J-WGC of 2007.

Main differences

- The influence of the territory
- Typical mountain soaring conditions
- Turbulence and strong sink
- Better lookout - improving airspace scanning techniques

The influence of the territory

The pilot must:

- Keep the ridge well in sight
- Constantly re-assess his distance from the ridge
- Safely assess the intensity of turbulence
- Scan the airspace effectively for other (glider) traffic and fixed obstacles (wires, cables)
- Specifically plan your flight
- Be well-rested, trained and current

The influence of the territory

General Rules - The pilot must:

- Have flown with a mountain-flying instructor
- Maintain higher flight speeds
- Keep excellent look-out
- Always prepare himself with a good pre-flight briefing (or self-briefing), before any flight, not only in contests
- Gradually explore the territory
- Study every landable area and fields, before the flight
- Plan the next phases of the flight during every climb
- Have the necessary and correct equipment/accessories

Typical mountain soaring conditions

- Ridge lift
- Thermal ridge lift
- Thermodynamic lift
- Convergence, cloud streets in mountainous terrain
- Valley breezes
- Sea breezes and the influence of mountain ranges
- Lee-side thermals
- Thermal-wave inside the valleys
- Wave flying

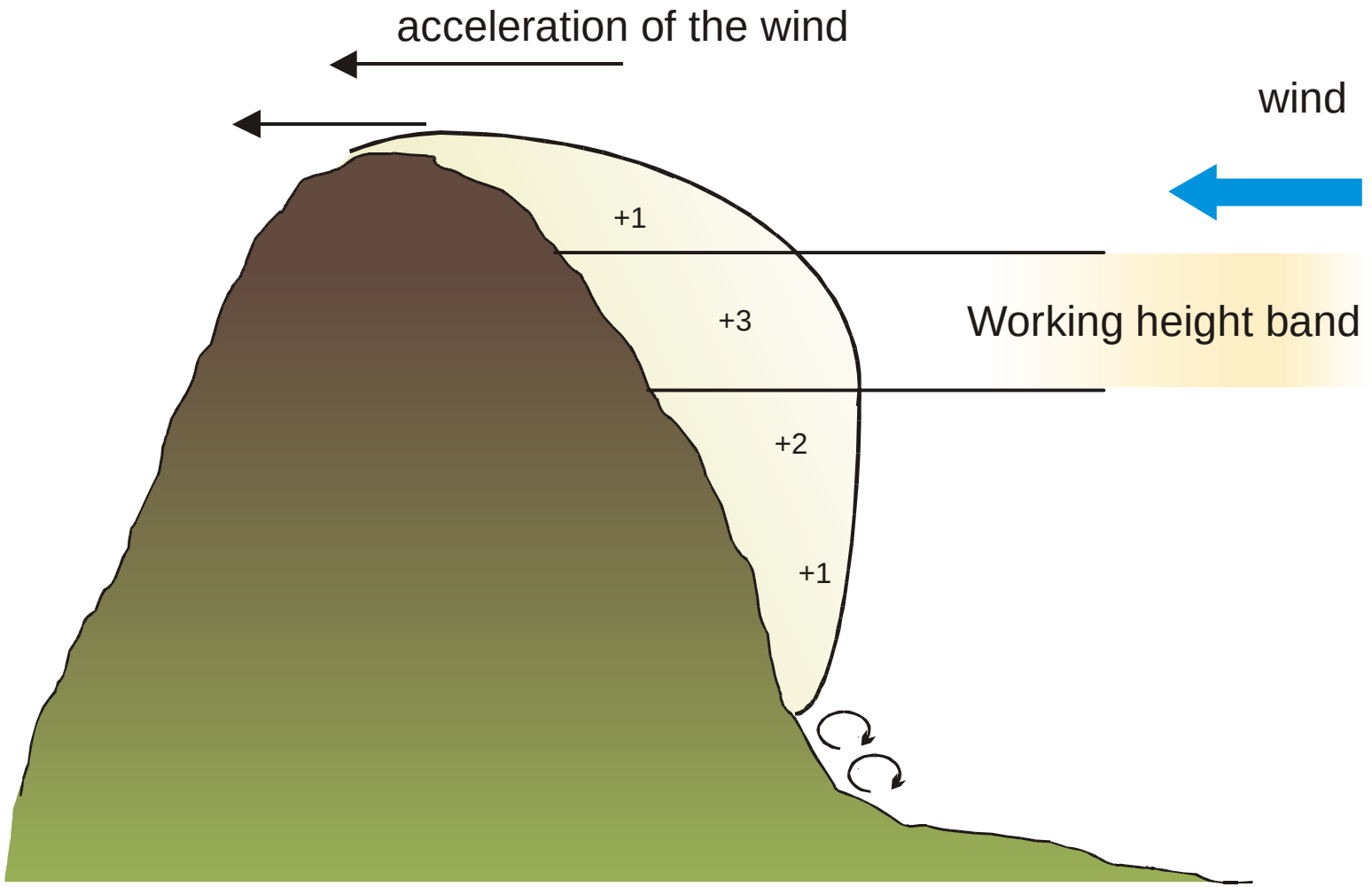
Ridge Lift

Requirement: wind

Flying technique

- Speed higher than E-max (Best Glide Speed)
- Correct “figure 8” turns
- Exploiting the most energetic height-band
- Adjust distance from the ridge accordingly to steepness of the ridge
- Placing the glider in the correct position over the ridge line

Ridge Lift



Ridge Lift

Warnings

- Wind gets stronger at the top of the ridge
- Look-out for cables and other obstacles
- Other gliders do fly on the same or opposite heading
- Always remember the basic rules for ridge flying:

  a) right of way

  b) overtaking

  c) turns: always turn away from the ridge

  d) safe distance from the ridge

Thermal Ridge Lift

Features:

Super-adiabatic gradient

Where to look for thermals

The tephigram and the thermal trigger points

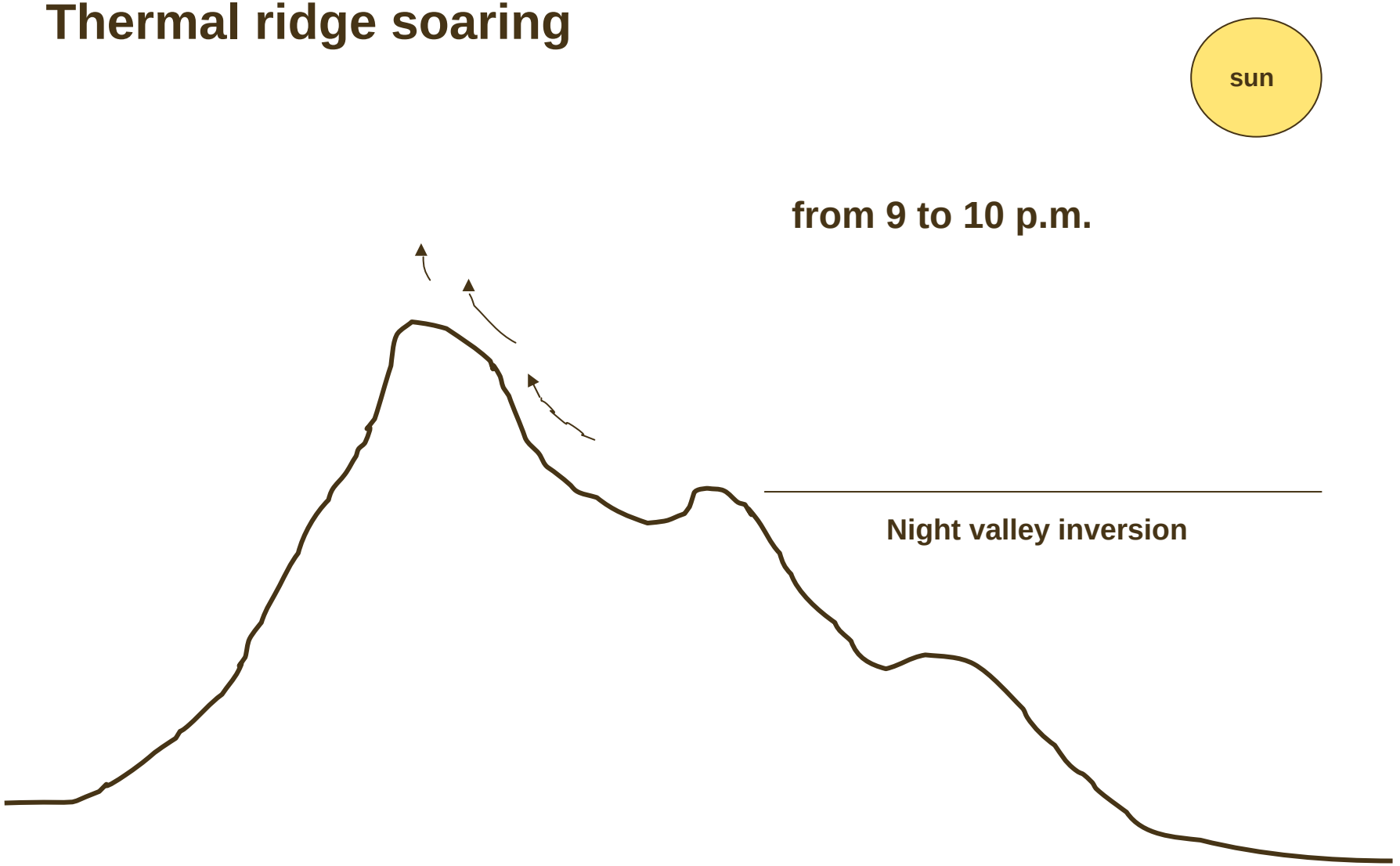
Thermals start from different places during different times of the day (position of the sun)

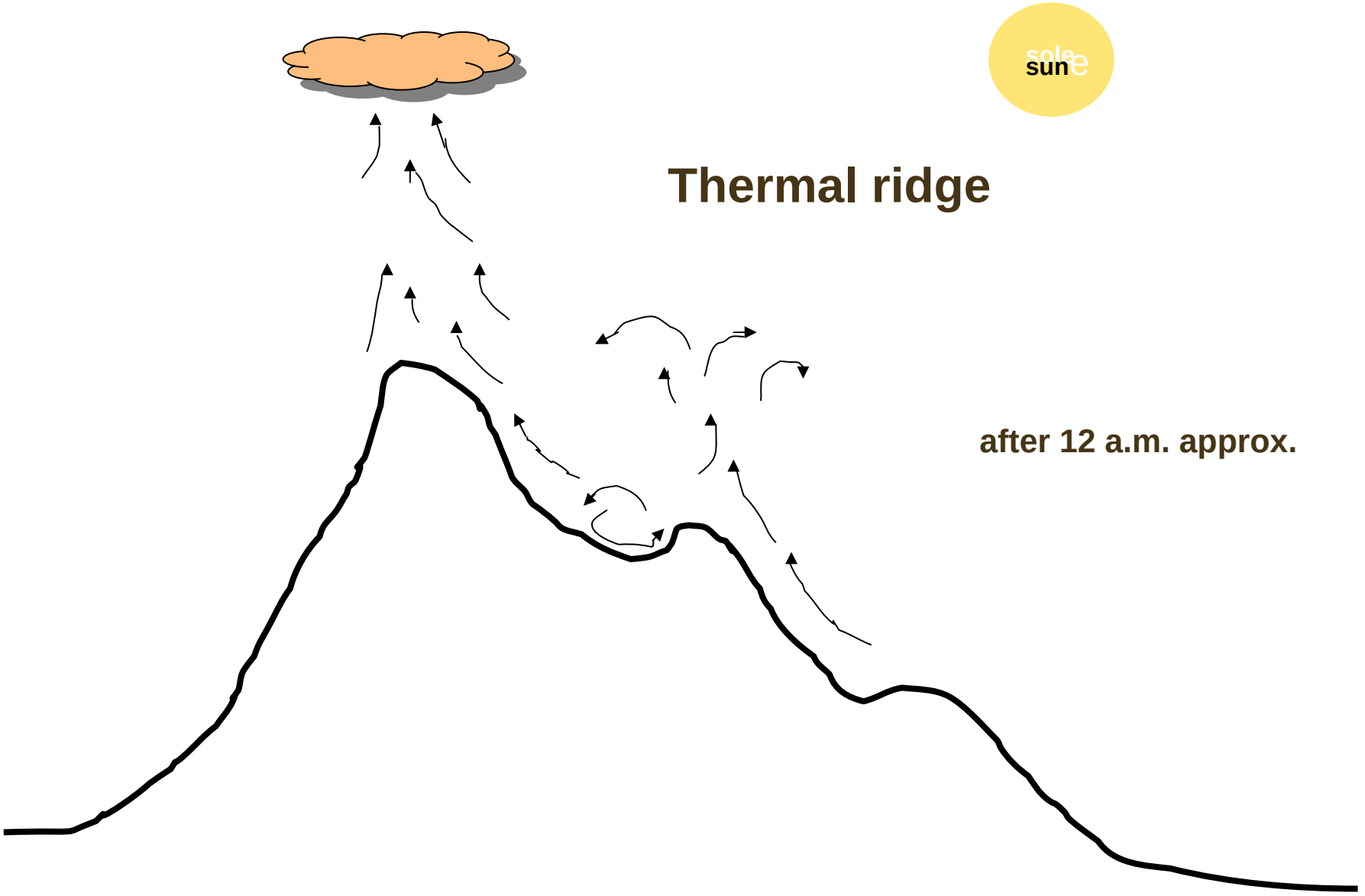
Thermal Ridge Lift

Warnings

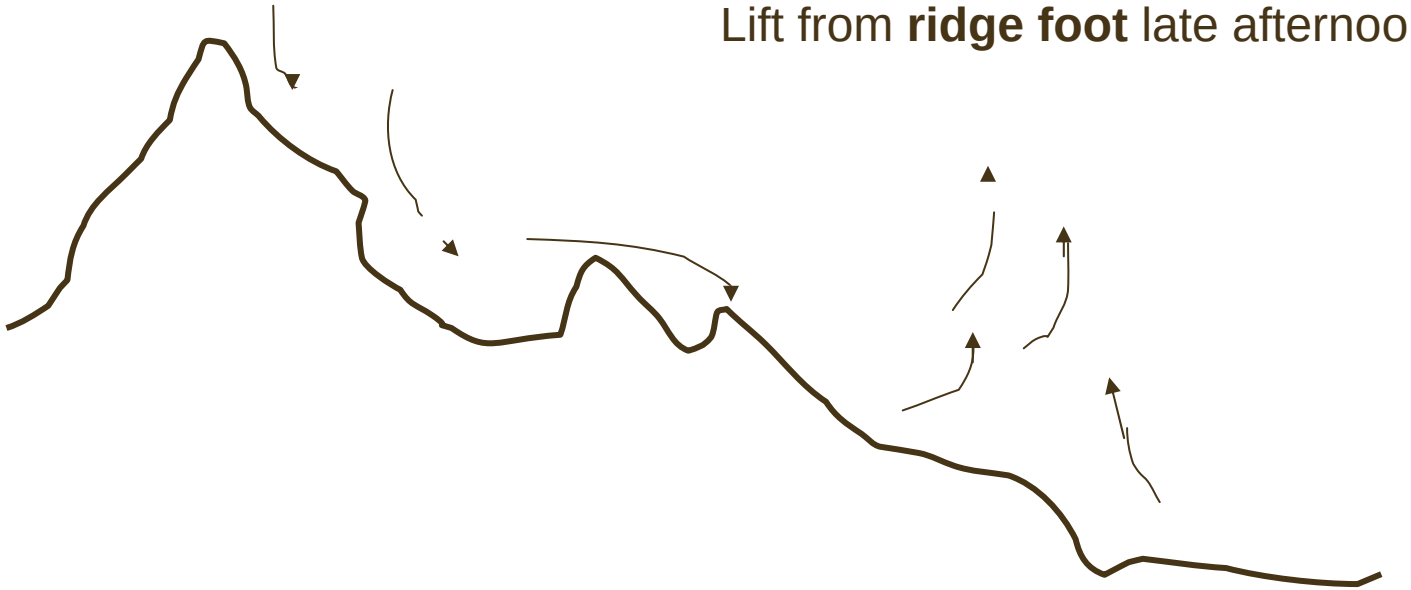
- Turbulence and strong sink; even worse when the inversion is close or below the top of the ridge
- Don’t progress into unknown, or dead-end valleys; avoid high plateaux
- Stalls can happen suddenly, much more frequently than over flatland. Keep safe flying speeds
- “Figure 8” turns until over the ridge top
- Keep excellent rudder/stick co-ordination

Thermal ridge soaring

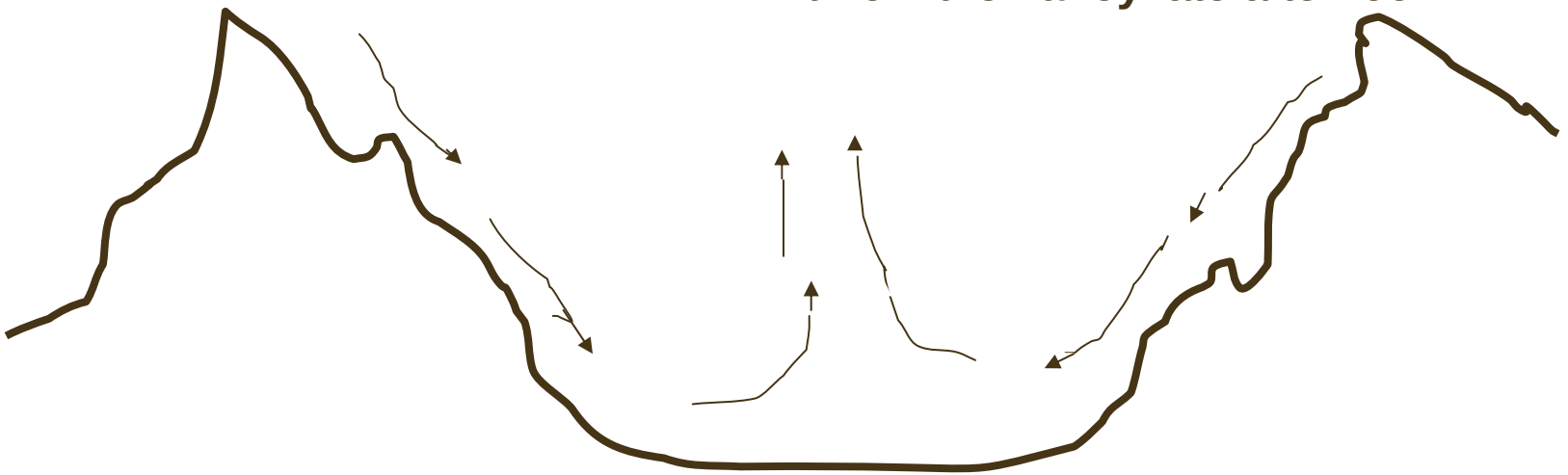



sun
Thermal ridge
after 12 a.m. approx.

Lift from **ridge foot** late afternoon



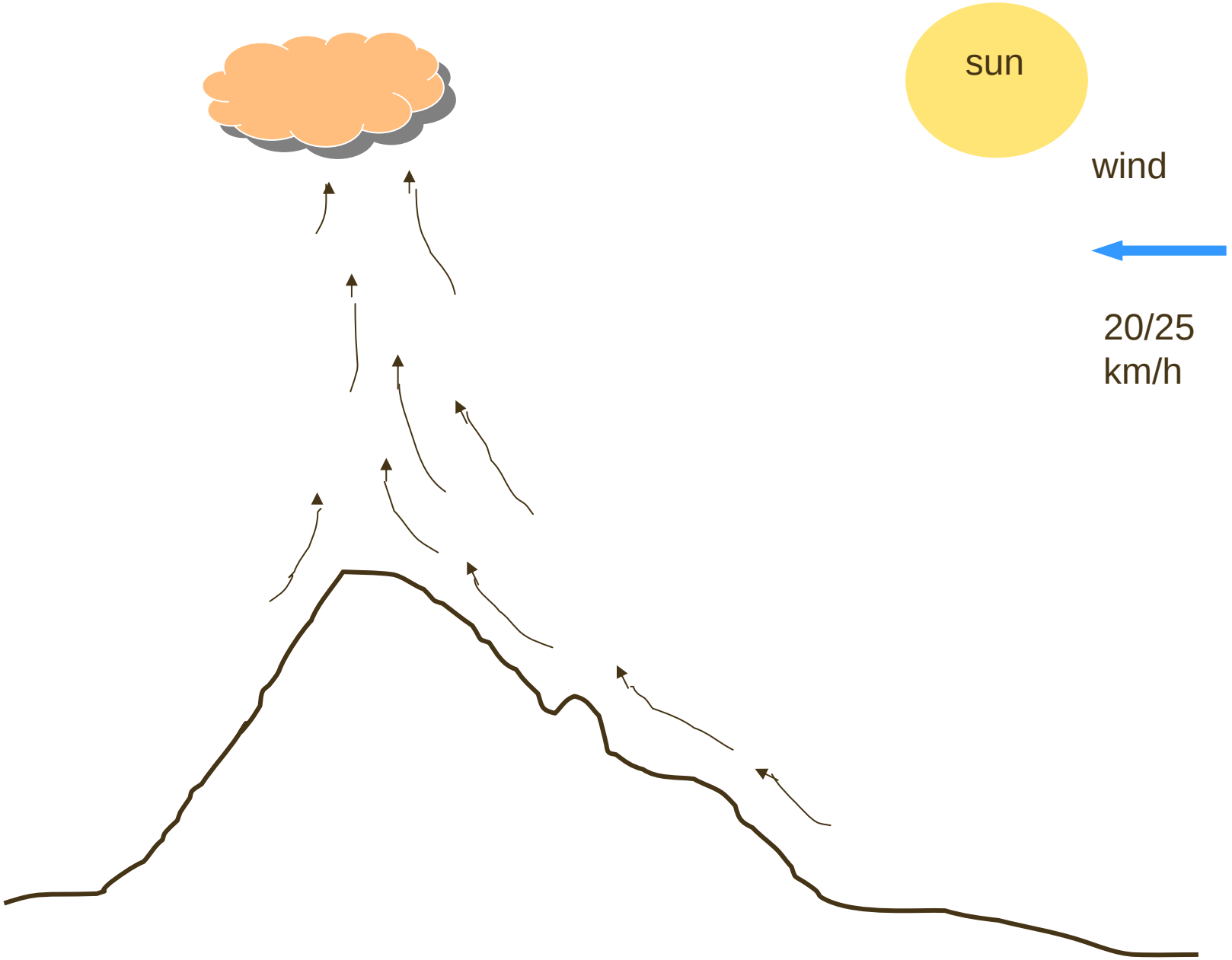
Lift from the **valley** late afternoon



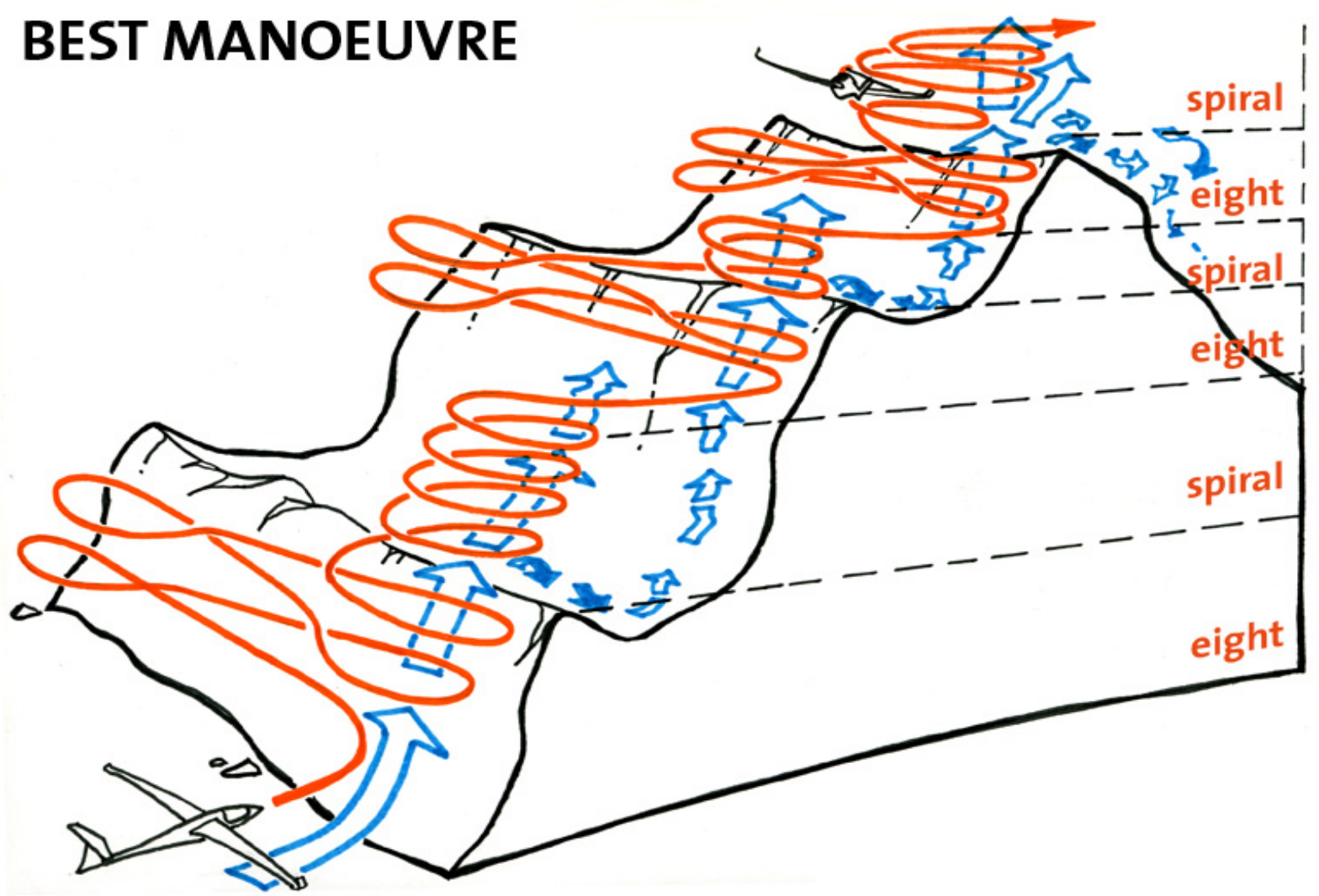
Thermodynamic lift

Requirements and features:

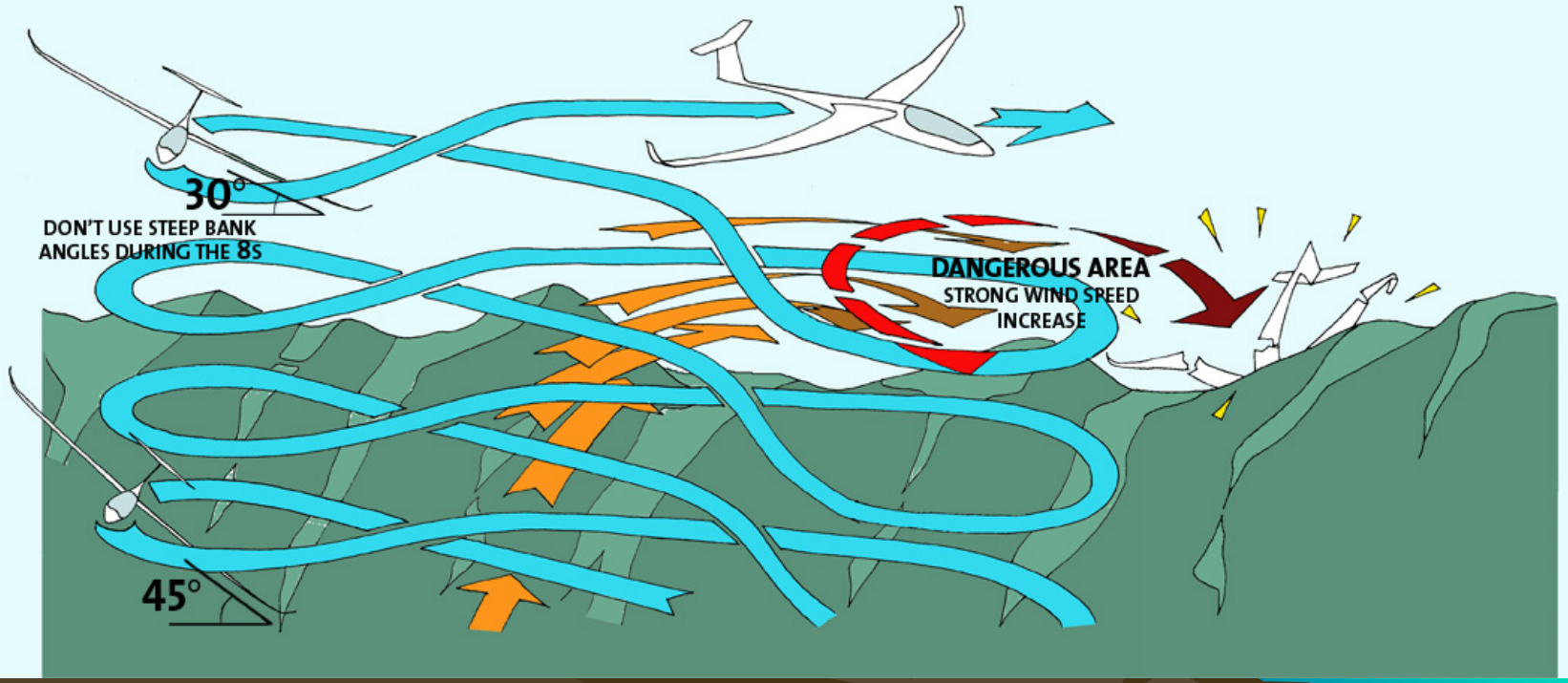
- The ridge surface must be exposed to the wind and sun at the same time
- The stronger the wind, the more ridge-flying techniques apply
- The weaker the wind, the more thermal-flying techniques apply


sun
wind
20/25
km/h

Eights flying or spirals on the slope in thermodynamic conditions



TRANSITION ZONE ON THE SLOPE
with quite strong wind



Thermodynamic lift

Warnings

- Climb as high as possible before crossing a gap
- Beware of wave resonance phenomena
- Same rules as per Thermal mountain-flying, even more important to fly “8s” instead of circles

Cloud Streets

How and where:

- Thermodynamic lift, good gradient up to condensation altitude, an inversion just above
- Convergence of air masses
- In the mountains, cloud streets are most often at 90° to the wind direction (whereas in the flatland, mostly parallel to wind)
- Cloud streets are stationary in mountain territory (in the flatland, they drift along with the wind)

Sea-breezes

How and where:

- Synoptic wind and the breeze: opposite directions
- High surface temperatures on the continental side
- Mountain ranges allow for easier soaring exploitation

Sea-breezes

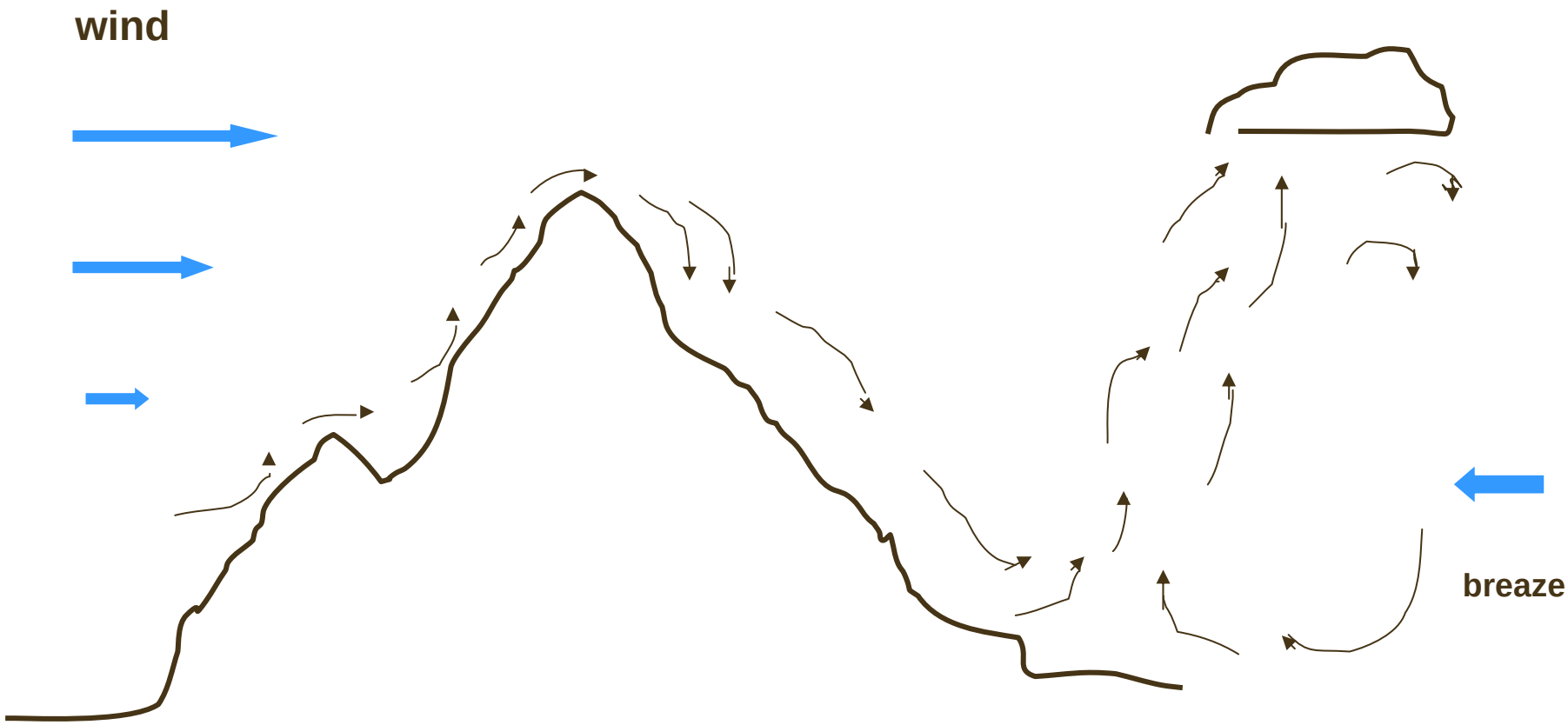
Exploiting Sea-breeze fronts

- They are easy to see and recognise
- Use the optimum height-band
- Turbulence can be challenging at lower altitudes; dangerous when in close proximity to other gliders

Lee-side Thermals

- The Lee-side face is exposed to the sun
- The thin boundary layer is overheated
- Rotors, in the lee-side, are a different thing from thermals
- Sun-heated ridge faces generate a breeze which opposes the synoptic wind
- Lee thermals can drift with the wind, after a while; seldom they are linked to a feature on the ground
- The need for an outlanding may arise very quickly; plan and be aware of landing opportunities

Lee-side thermals



Thermal-Wave

Lee Thermal-Wave

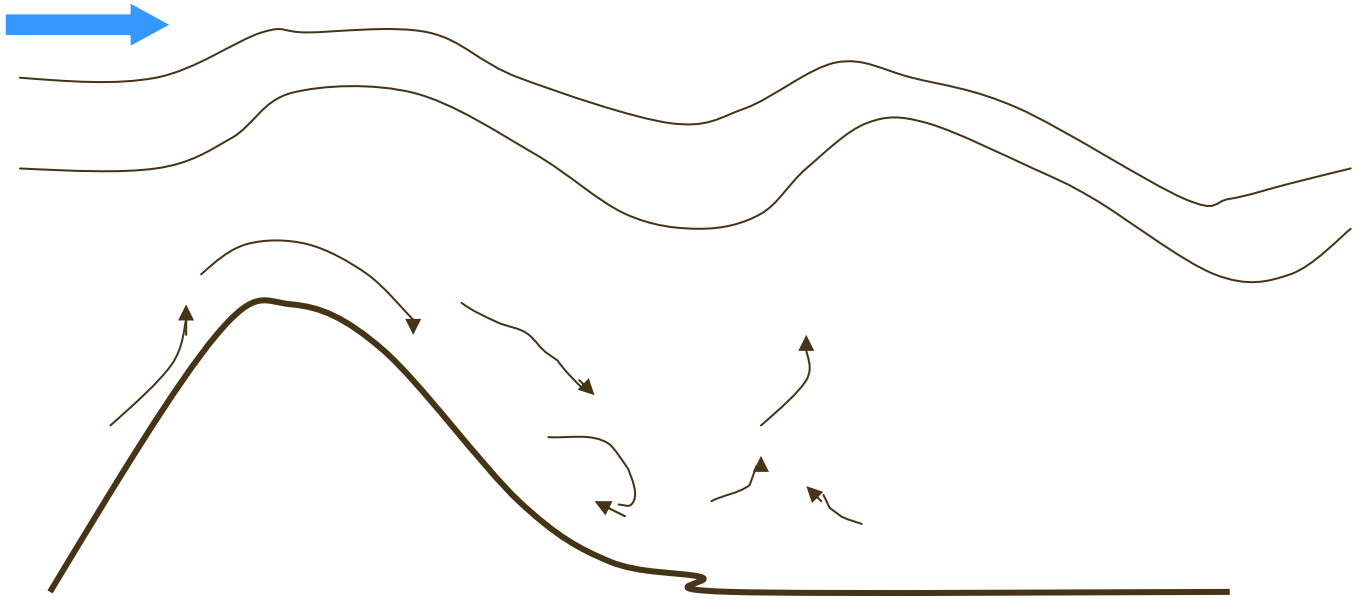
Often get their origin from Lee-side Thermals, together with weak waves in the upper layers

- Identifying the optimum distance from the ridge
- Not good for huge height gains, but excellent for long runs without height-loss
- Generally turbulence-free

Thermal-Wave

(Lee Thermal-Wave)

Wind 20/25 km/h



Thermal-Wave

(Windward Thermal-Wave)

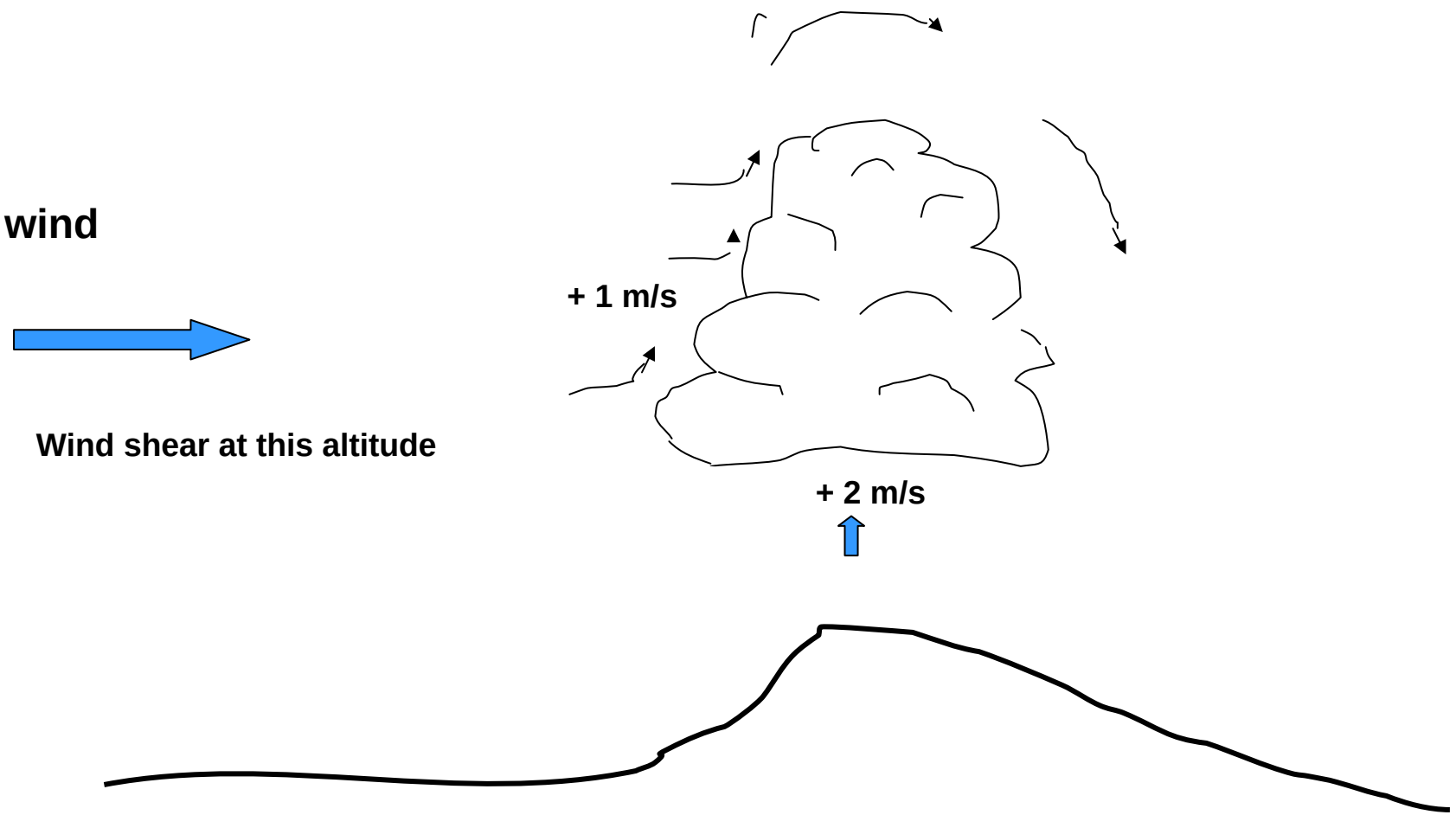
Occurs when there are a wind shear at the altitude of condensation associated witgh an inbcrease in wind speed.

On the face of cumuli exposed to the wind, and to the sun

Transition from thermal below cloud-base, to wave, is tricky

The correct technique

Windward thermal wave

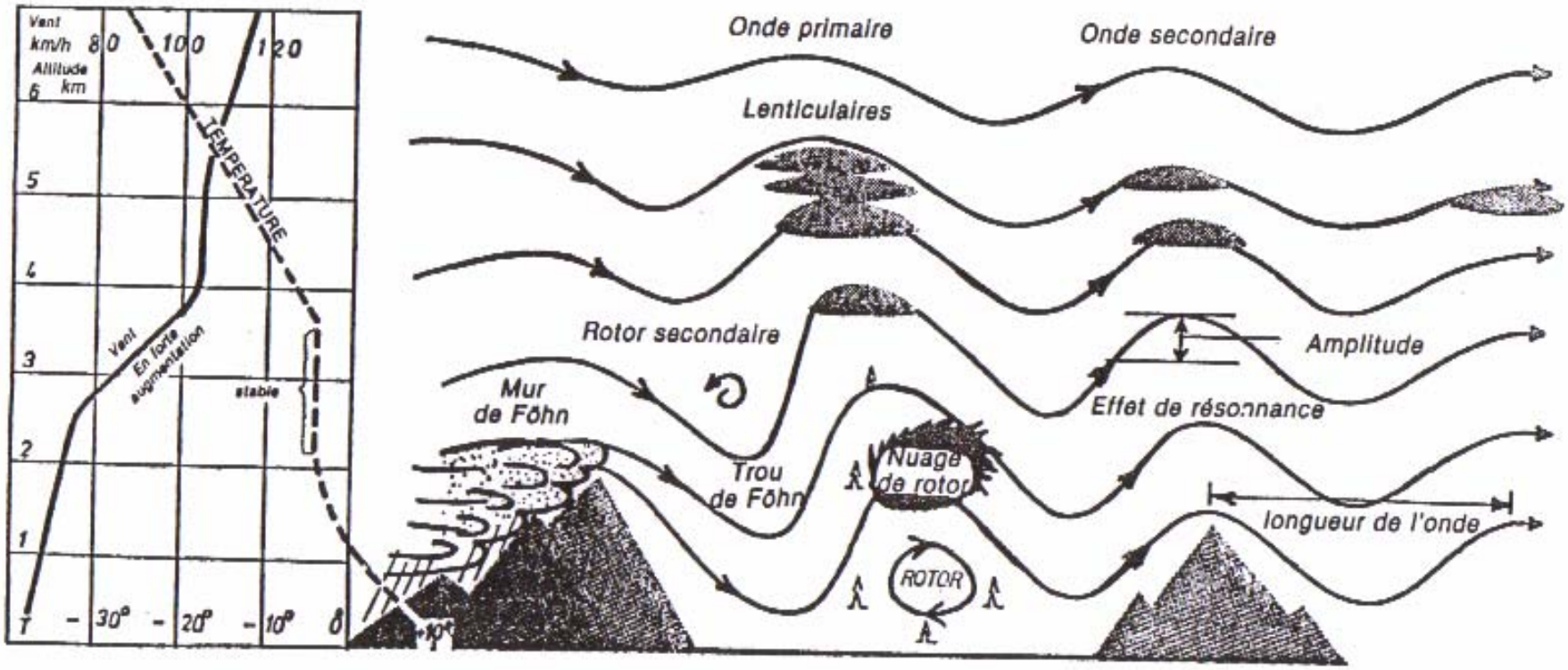


Wave Flying

Prerequisites for the generation of waves

- Wind direction relative to the mountain range/ridge
- Wind speed gradient
- Relative stability in the upper layers

TAV. 50



Schema delle Lenticolari e dei Rotori

Wave Flying

Warnings

a) the pilot can suffer from:

- **Hypoxia and its effects**
- **Low temperatures**
- **Reduction of his judgement/abilities**
- **Effects of the strong winds**
- **Setting of the sun**

b) the glider can be damaged:

- **Excessive speed (Vne, Va, Vra, altitude)**
- **Cracks in the gelcoat**

THE END