# Theory Lesson # 10

## Unit 33 – Thermal Sources and Structure

# Aim

This unit covers:

- **Vertical thermal structure and lifecycle**
- **Thermal sources and triggers**

*Note : Horizontal Thermal Structure is covered in Unit 30 - Thermal Centring*

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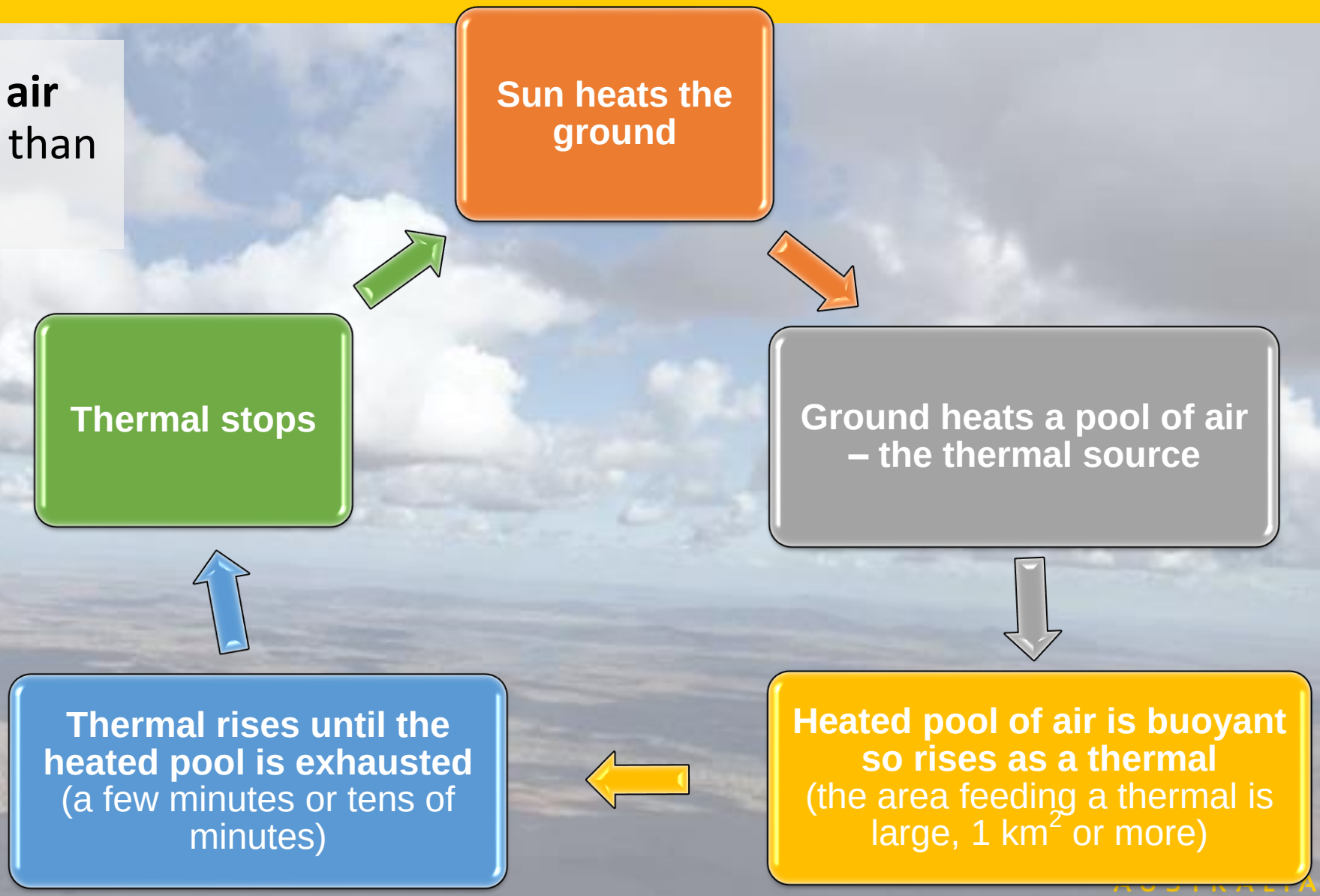
# Thermals and Thermal Sources

**Thermals are rising buoyant air** that is hotter or more humid than the surrounding air



# Ground Features as Thermal Sources

Darker and drier areas of the ground heat more than lighter moister areas

- Rock, townships and dark areas are good early in the day
- Green grassy areas, forests and swamps are not
- If they warm up, moist areas produce good thermals late in the day

# Ground Features as Triggers

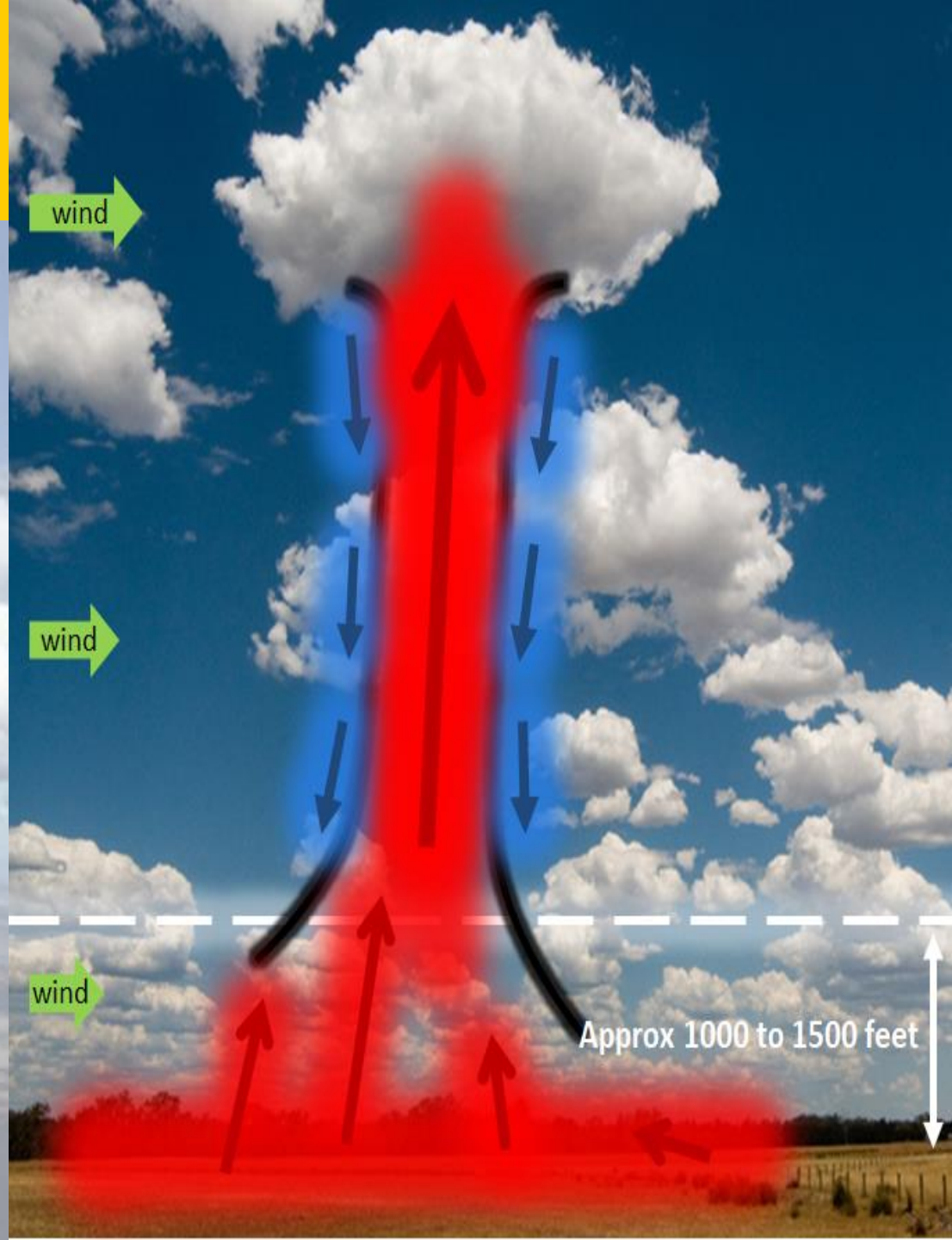
**Triggers** allow a heated pool of air to break away from the surface tension at the ground

Triggers relatively are relatively small features such as machinery, lines of trees, and upwind edge of lakes

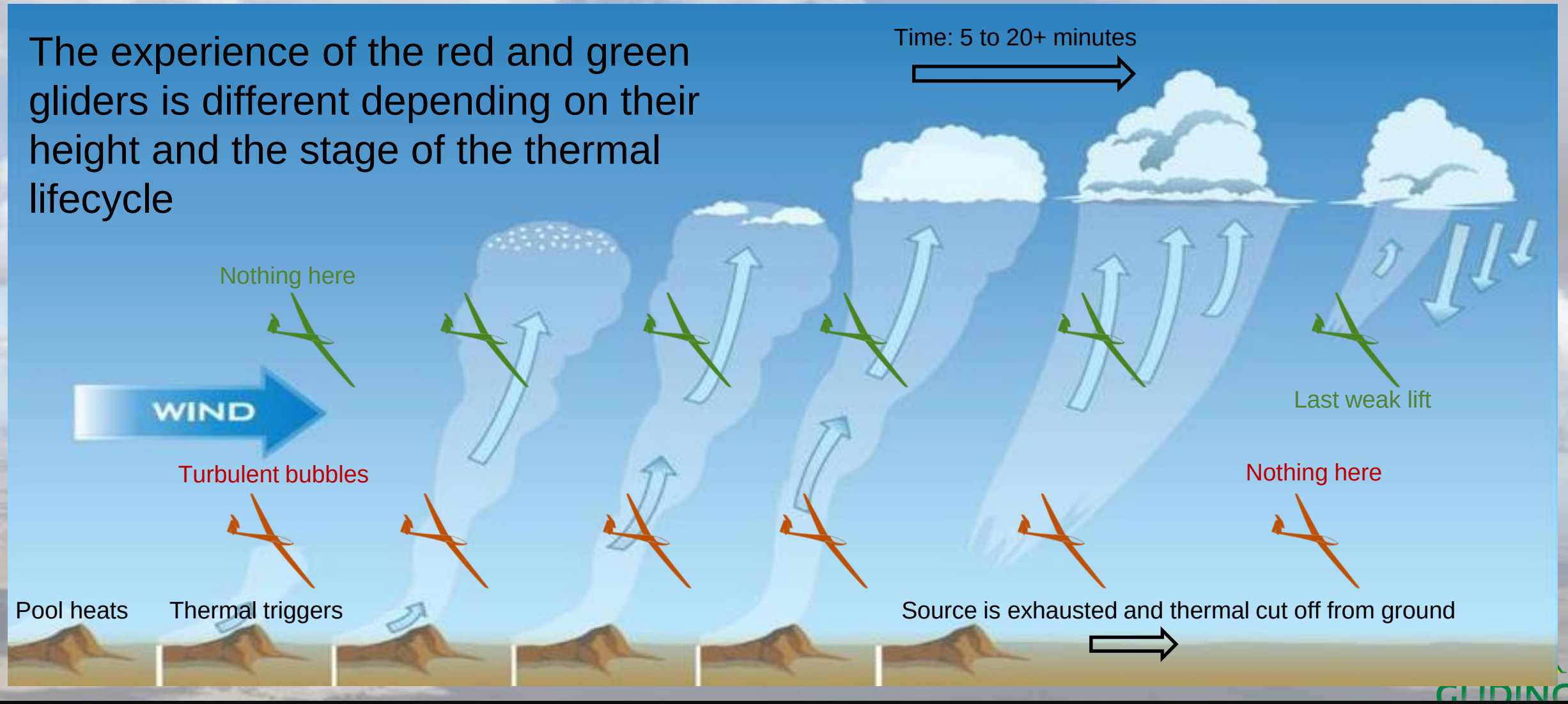
# Vertical Thermal Structure

1. A pool of warmer air near the ground breaks away in multiple narrow and turbulent cores (super-adiabatic layer) before forming a single core
2. The core rises until the air temperature in the thermal is roughly the same as the surrounding air – then it spreads out
3. Cumulus cloud will form (water vapour forms water droplets) **<u>if</u>** the thermal cools enough to reach the dew point

Around the outside of the thermal is a ring of sinking air, shown in blue



# Thermal Lifecycle – Plumes and Bubbles




You may not find a thermal when you fly over a good source and trigger – it may be at the wrong part of its cycle

# Effect of Convection Height

Higher thermals:

- Are normally stronger
- Have a longer life cycle
- Are further apart

Rule of Thumb:

Thermals are often about the same number of km apart as the convection height in thousands of feet

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# Effect of the Wind on Thermals

- Thermals drift with the wind, or generally slightly slower due to the inertia of the thermal mass
- At any point in time the thermal column is almost vertical, with a slight lean downwind in the common situation where the upper wind is stronger  than the lower wind
- The thermal column can be distorted by wind shear at different heights. This can make it difficult to stay in the core and you may have to re-centre often

Further information will be available in the Advanced Training Syllabus

Not currently part of GPC syllabus

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# Safety

At low level the thermals are disorganised and gusty with individual cores likely to be short-lived.

Care must be taken when thermalling at low level due to the possibility of a spin

**Safe speed near the ground** must be maintained when thermalling at low level

A **clear break-off point** at a safe height is essential to allow a safe circuit and landing.

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