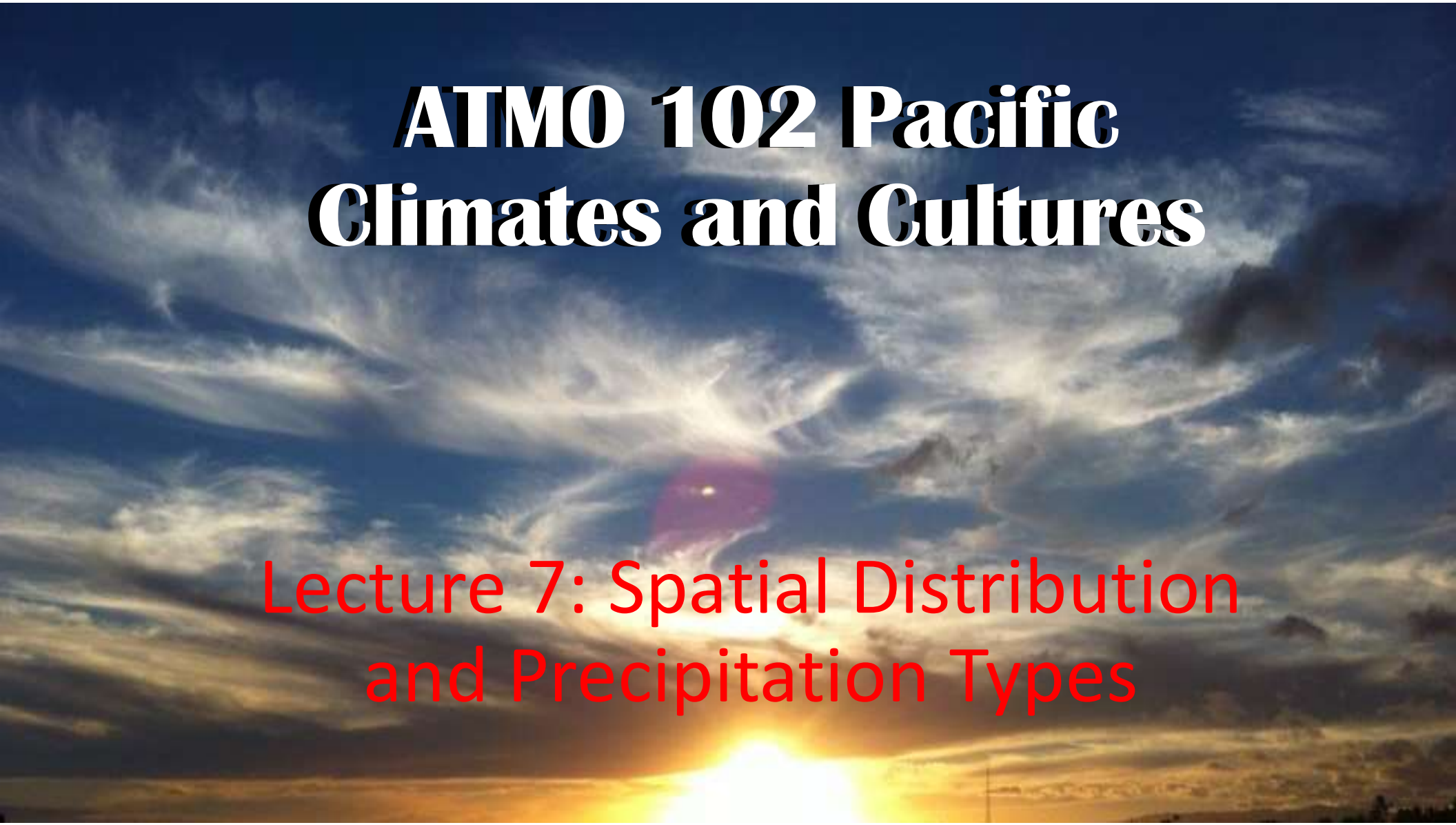
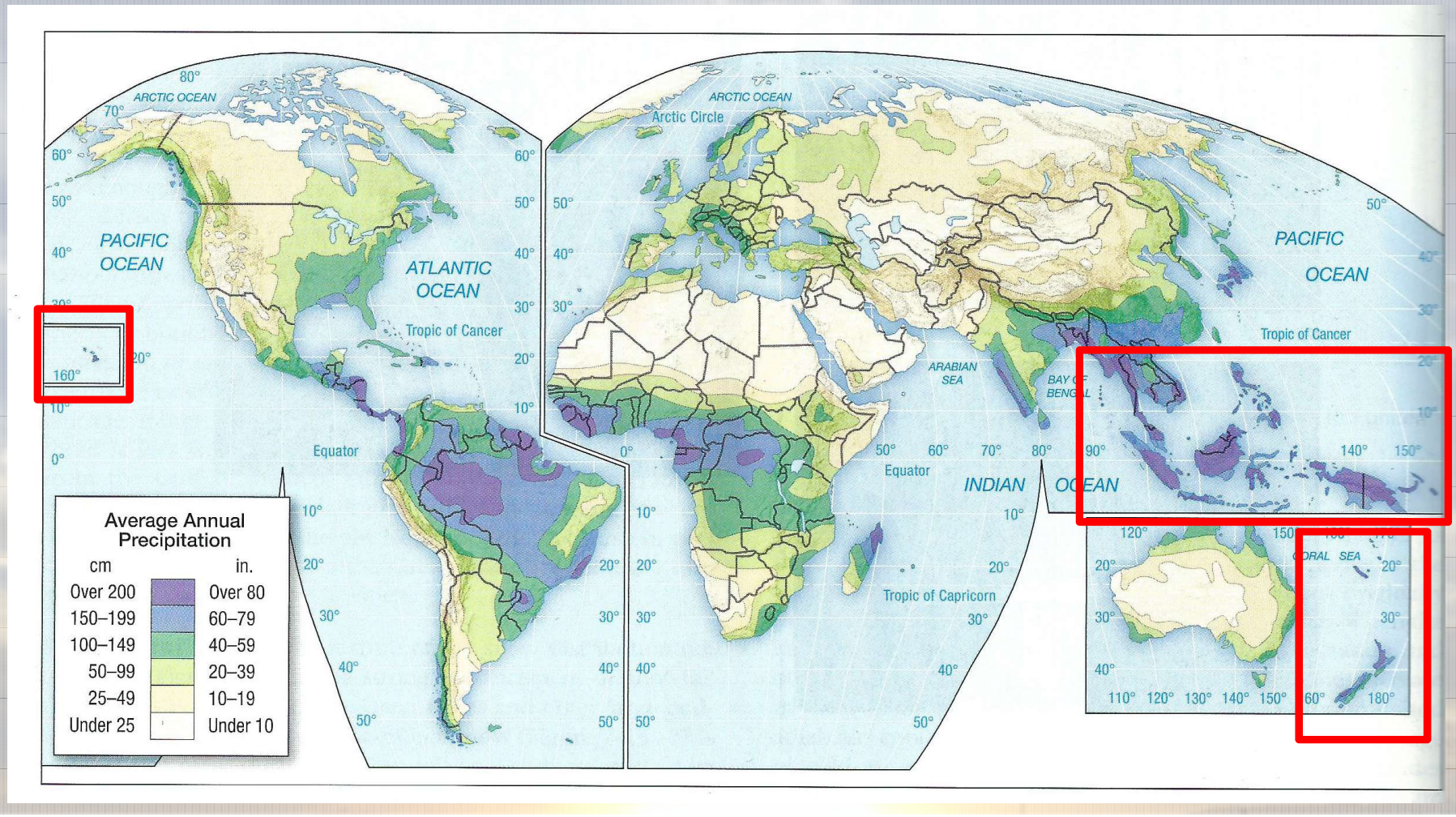


ATMO 102 Pacific Climates and Cultures

Lecture 7: Spatial Distribution and Precipitation Types

Global Precipitation Distribution



Forms of Precipitation

- Rain – ***Ua***
  - ***ua loa*** – Extended Rain
  - ***ua poko*** - Short Rain
  - ***ko'iawe*** – light moving rain
  - ***kili hau*** – chilly rain
  - ***ua nāulu*** – showery rain
  - ***ua hō'e'ele*** – drenching rain
  - ***ua lani pili*** – rain downpour
  - ***ua ho'okina*** – continuous rain
  - ***ua hekili*** – rain with large drops
  - ***ua hikiki'i*** – slanting rain
  - ***ililani*** – unexpected rain
  - ***uakoko*** – rainbow-hued rain
  - ***kuāua hope*** – spring rain

- Snow – ***Hau***

- Sleet and Glaze - None

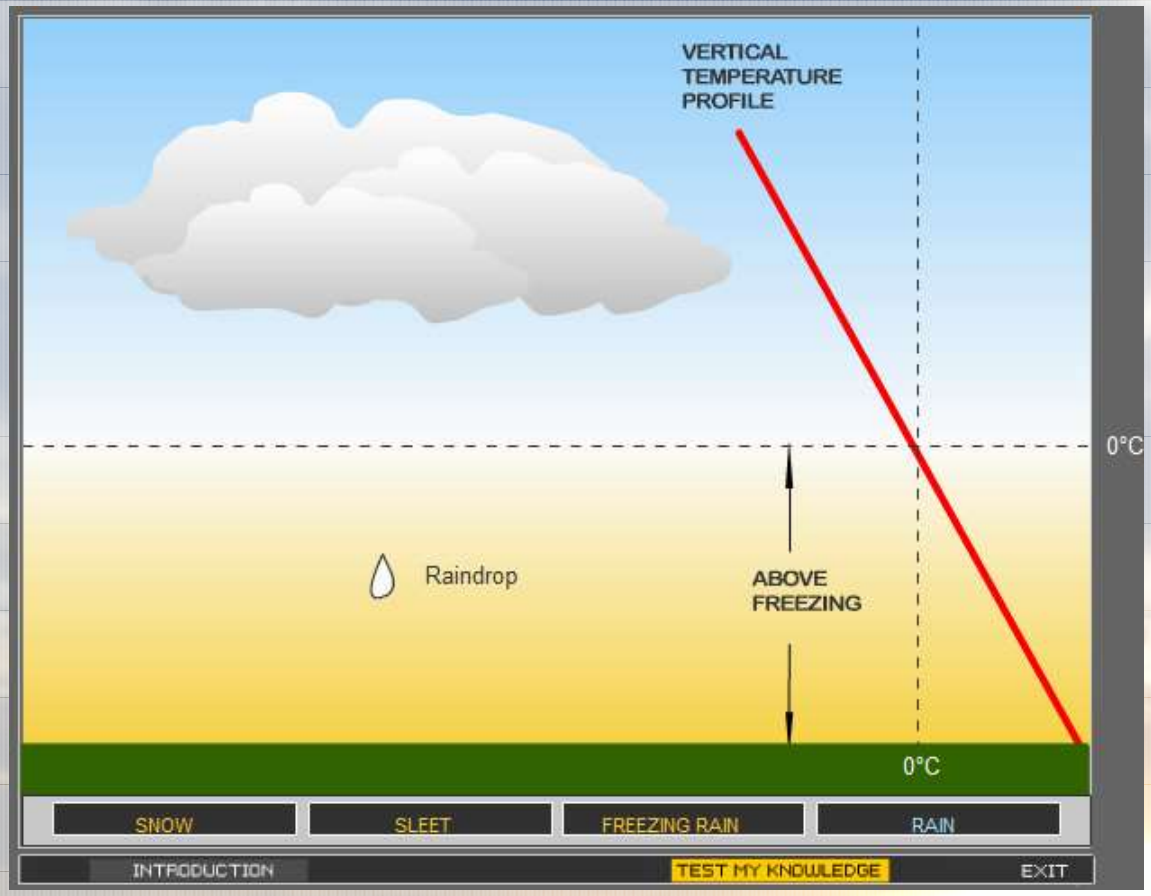
- Hail – ***Huahekili***

- Rime - None

Rain – *Ua*

- Drops of water that fall from a cloud and have a diameter of **at least 0.5 millimeter**.
- Most rain starts as **SNOW** and **MELTS**
- Small drops are called **DRIZZLE** and **MIST**
- **Virga** – Rain that evaporates before reaching the surface.
- **Flooding** can be severe – **Flash Flood Warnings**

Atmospheric Profile for Rain – *Ua*

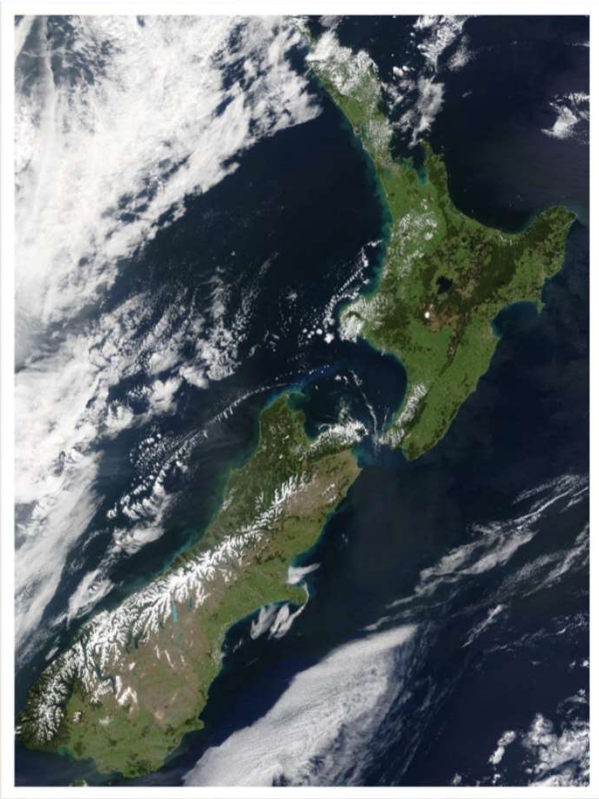


- Atmosphere is warm, **above freezing** , from the surface through to the cloud layer.
- Rain can start out as an **ice crystal** (Bergeron Process) or as a **large droplet** (Collision-Coalescence).
- Hits the surface as a **liquid**.

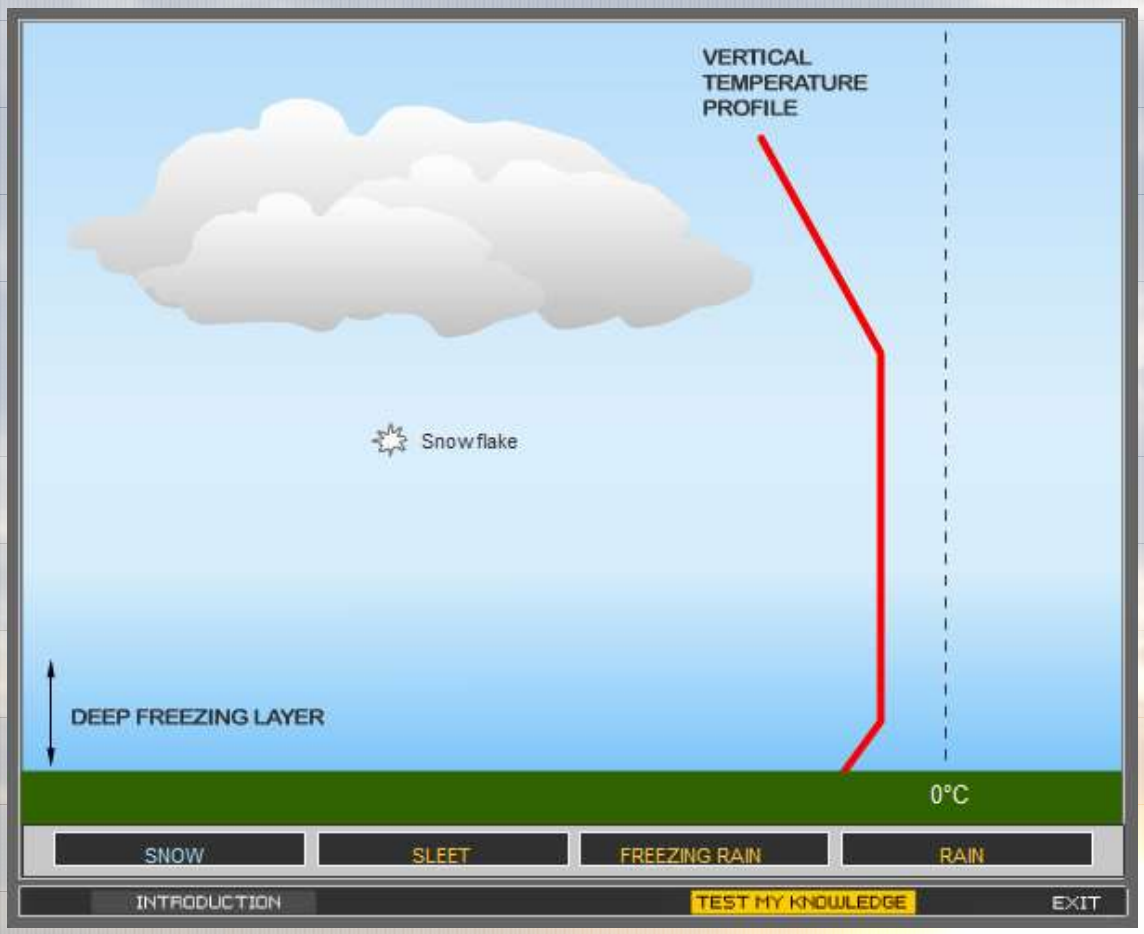
Heavy Rain in Action

Snow – *Hau*

- Ice crystals and clumps of Ice crystals
- **Very Cold Conditions**: Individual crystals make "light snow"
- **'Warmer' Cold Conditions**: Crystals form clumps "wet snow"
- Mauna Kea and New Zealand are the main locations with snow in the Pacific Region
  - Snow in Maori - ***hukarere***



Atmospheric Profile for Snow – *Hau*

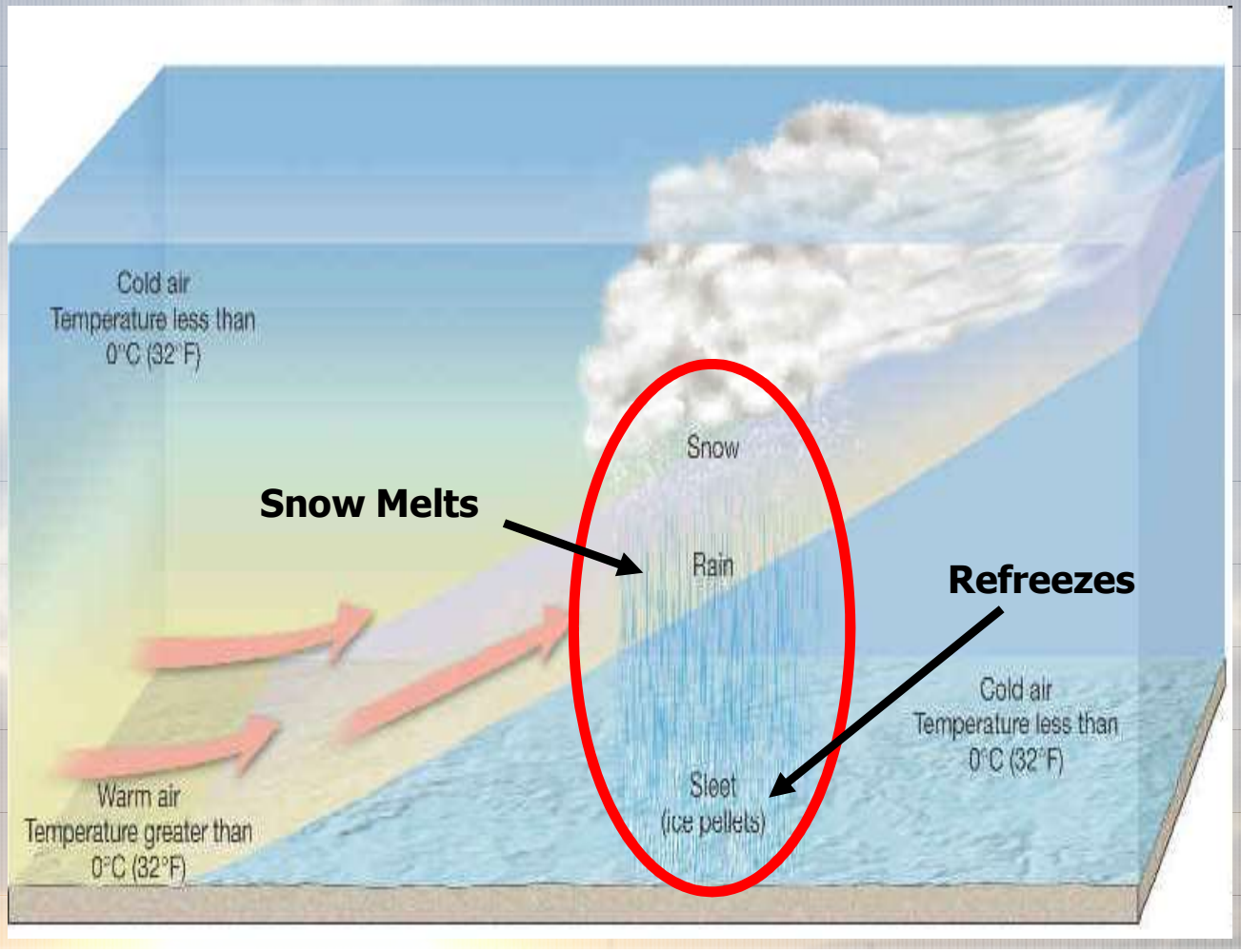


- Atmosphere is cold, **below freezing**, from the surface through to the cloud layer.
- Snow will start out as an **ice crystal** (Bergeron Process) with the crystals continuing to grow.
- Hits the surface as **solid ice crystals**.

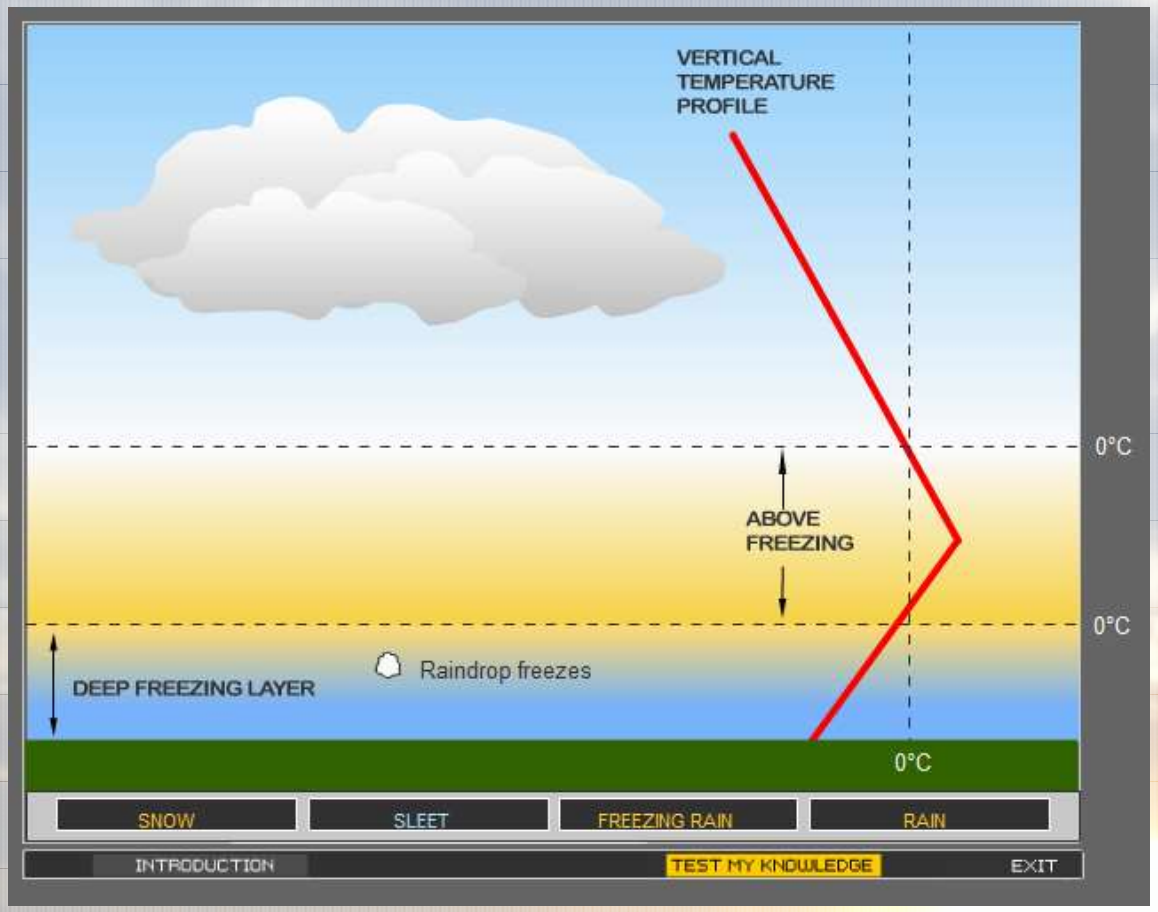
Time Lapse of a Blizzard

Sleet – *waiwaha (in Maori)*

- Rain that freezes near the surface
- Wintertime phenomenon
- **Clear** to translucent pellets (**Ice Pellets**)



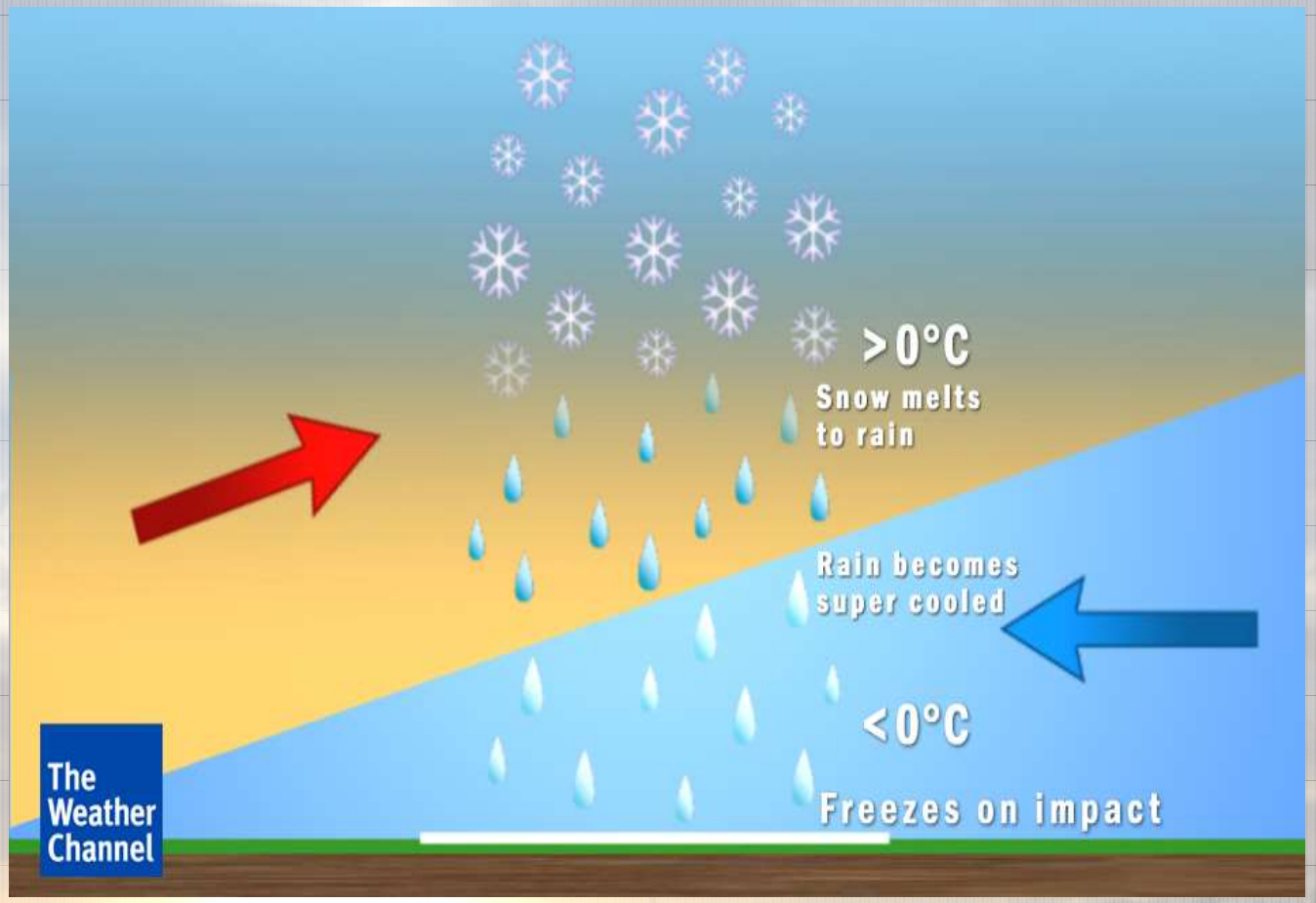
Atmospheric Profile for Sleet - *waiwaha*



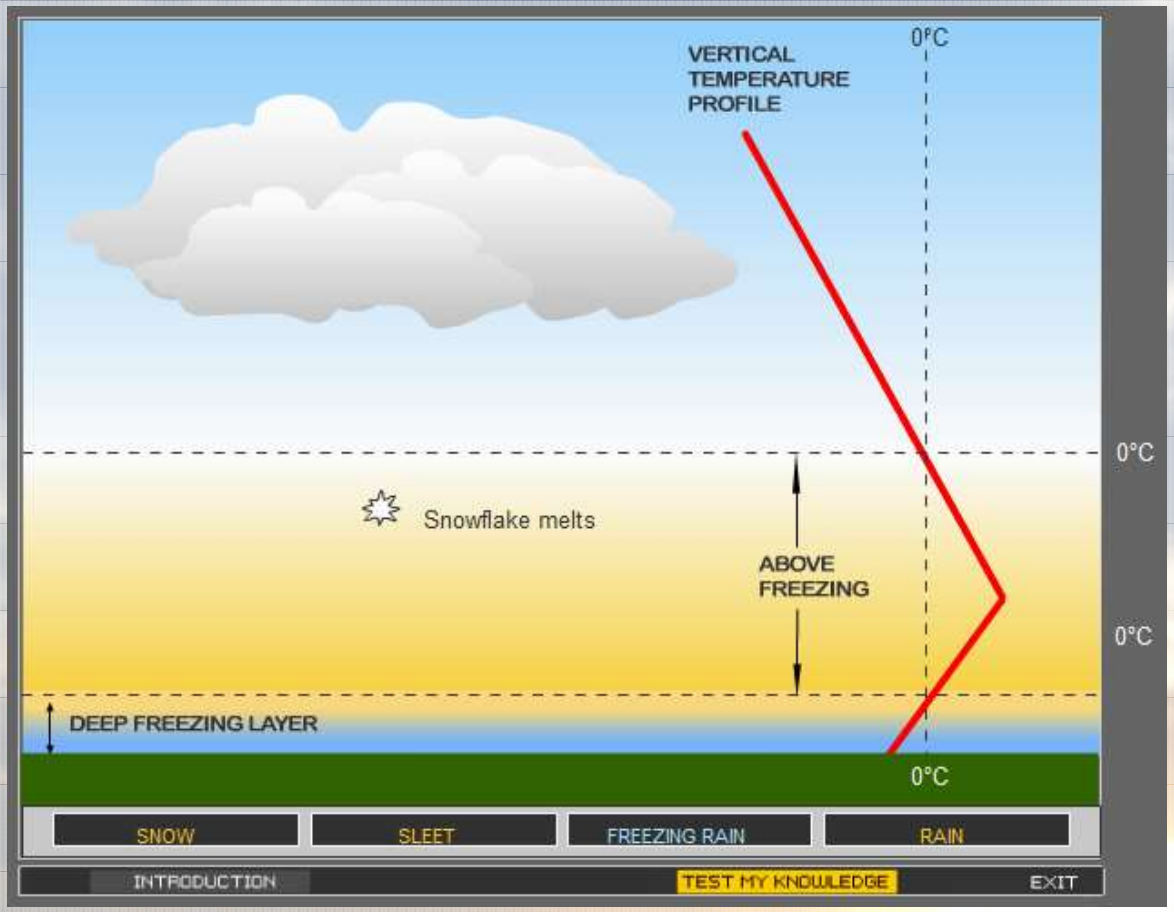
- Atmosphere is cold, **below freezing**, in the cloud layer and at the surface. However, in the case of sleet there is a layer in between that is **above freezing**.
- Snow will start out as an **ice crystal** (Bergeron Process) with the crystals continuing to grow.
- Melts in the warm, above freezing, layer.
- Precipitation transforms from snow → rain → ice pellet (sleet)
- Hits the surface as **solid ice pellets**.

Freezing Rain and Glaze – *mīti ua (in Maori)*

- Rain or drizzle that falls in liquid form and then **freezes upon striking a cold object or ground**.
- The coating of ice is called **Glaze**.

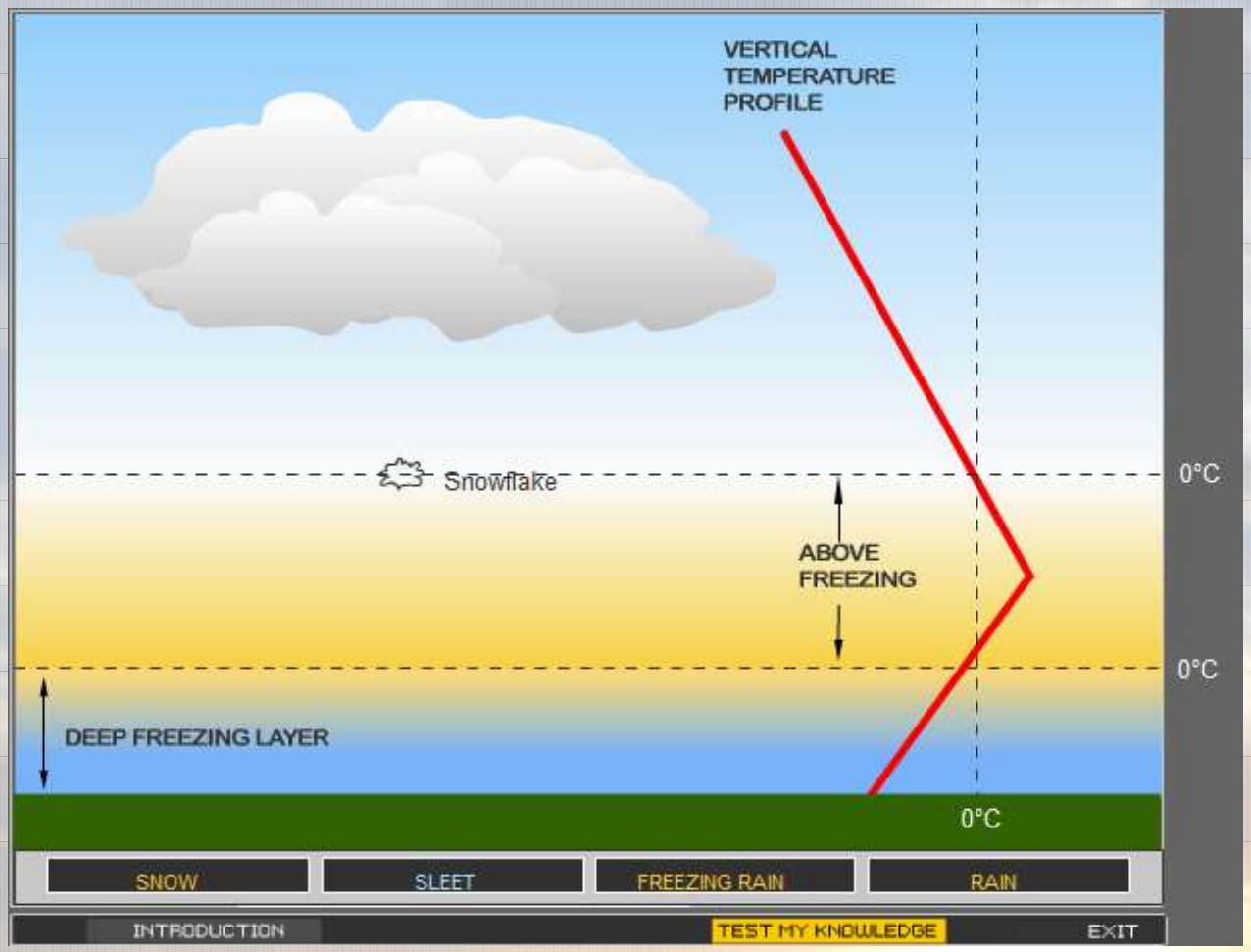


Profile for Freezing Rain



- Atmosphere is cold, **below freezing**, in the cloud. Then, above the surface there is a warm, **above freezing**, layer than melts the snow.
- Then, just at the surface there is a layer of **below freezing** air (just above the surface) that causes the rain drop to **freeze** on contact with the surface.

Interactive Images for Precipitation



- All of the previous diagrams are actually interactive images that you can access from the link below:

- http://apollo.lsc.vsc.edu/classes/met130/notes/chapter7/51_Sleet/A_51.swf

Hail - *Huahekili*

- In Hawaiian the work ***huahekili*** means “thunder fruit”
- In Maori there are several words for hail
  - ***ua whatu***
  - ***hukātara***
  - ***ua nganga***
  - ***hukāwhatu***

- **Rounded WHITISH Pellets and Irregular lumps of ice**

- Usually 1-5 cm
  - Can weigh up to a pound.

- Can be very destructive and damage cars, crops, and even kill people!

Hail Formation in Words

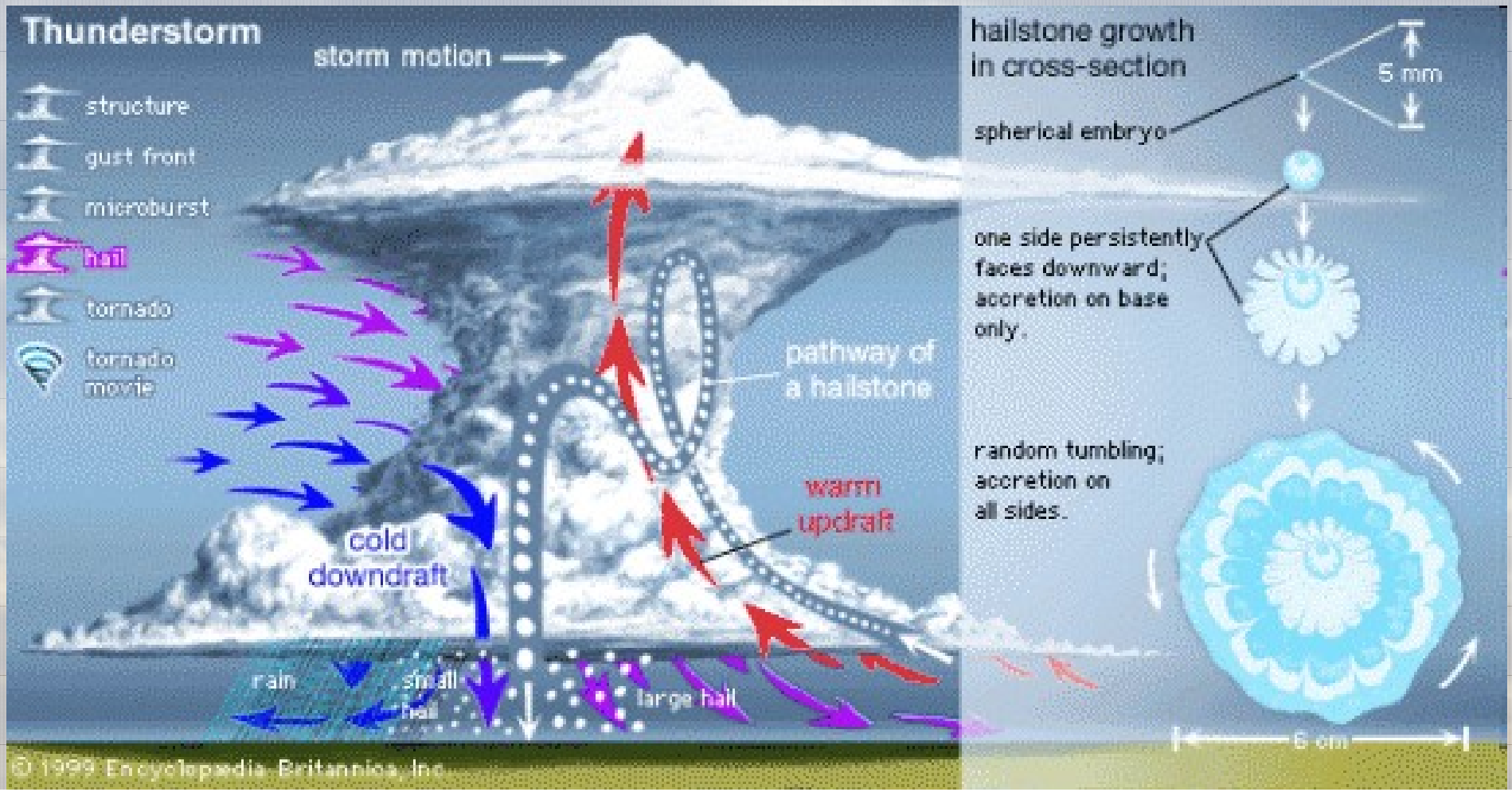
Record-setting hailstone from the Hawaii 'supercell' thunderstorm that hit the Hawaiian island of Oahu.

A final measurement of the hailstone, which dropped from the skies on Mar 9, 2012, places it at 4.25 inches long, 2.25 inches tall and 2 inches wide (10.8 by 5.7 by 5 centimeters).

The previous record was only 1 inch in diameter. In fact penny-size (just under an inch) or quarter-size (1 inch in diameter) hailstones, have been reported just eight times in Hawaii.

- Produced in a **Cumulonimbus** cloud
- **Grauple** or **large frozen rain drops** act as embryos
  - **ACCRETION:** They accumulate supercooled water, adding new layer
- Violent, **upsurging air currents** within the storm carry these embryos up through the cloud.
  - Low liquid water makes a white layer
  - Higher liquid water makes a clear layer
- When the updraft can **no longer keep it aloft** it falls to the surface.
- The more violent the storm the larger the hail can become.

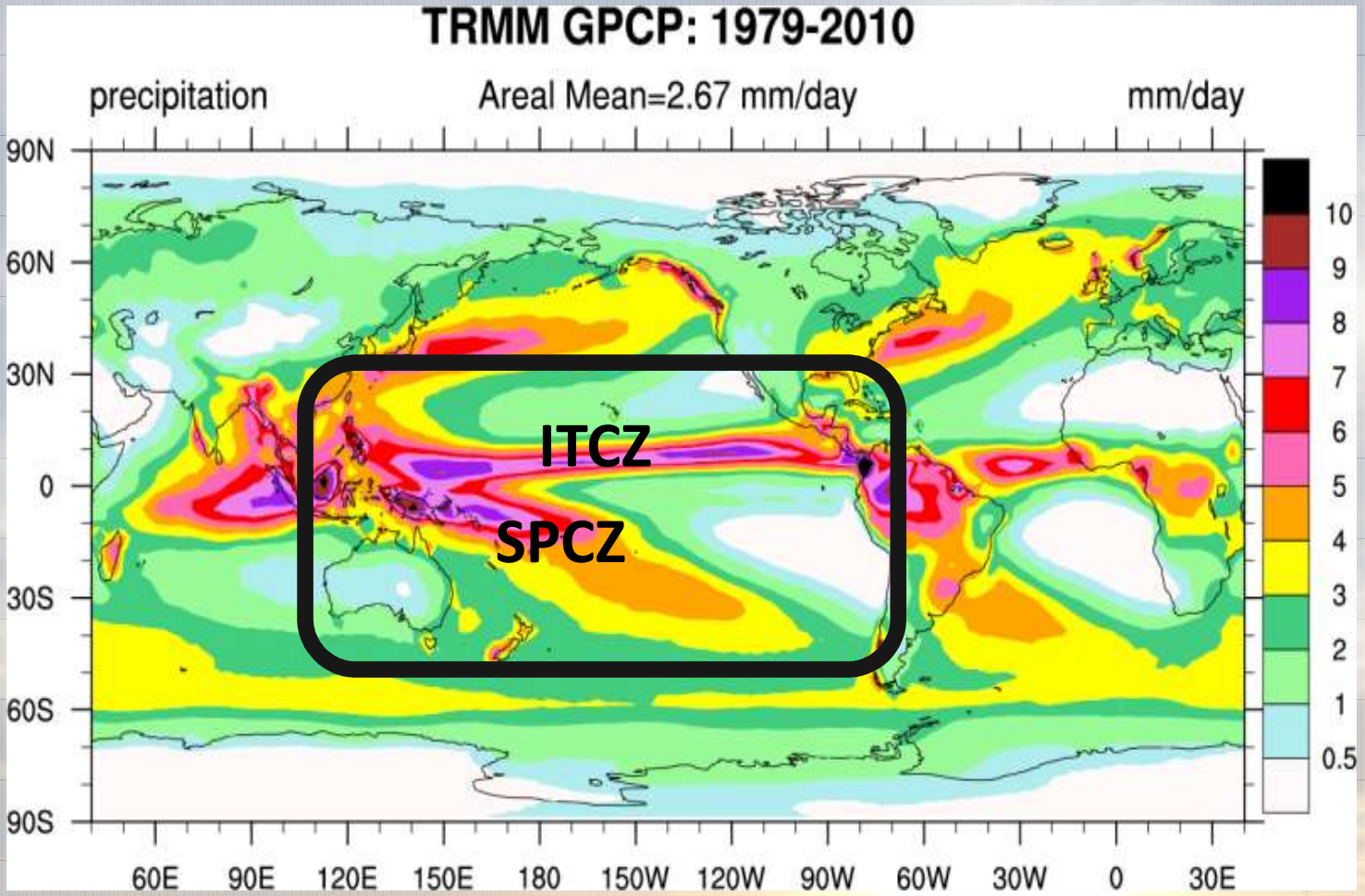
Hail Formation Diagram



Hail in Kailua March 2012

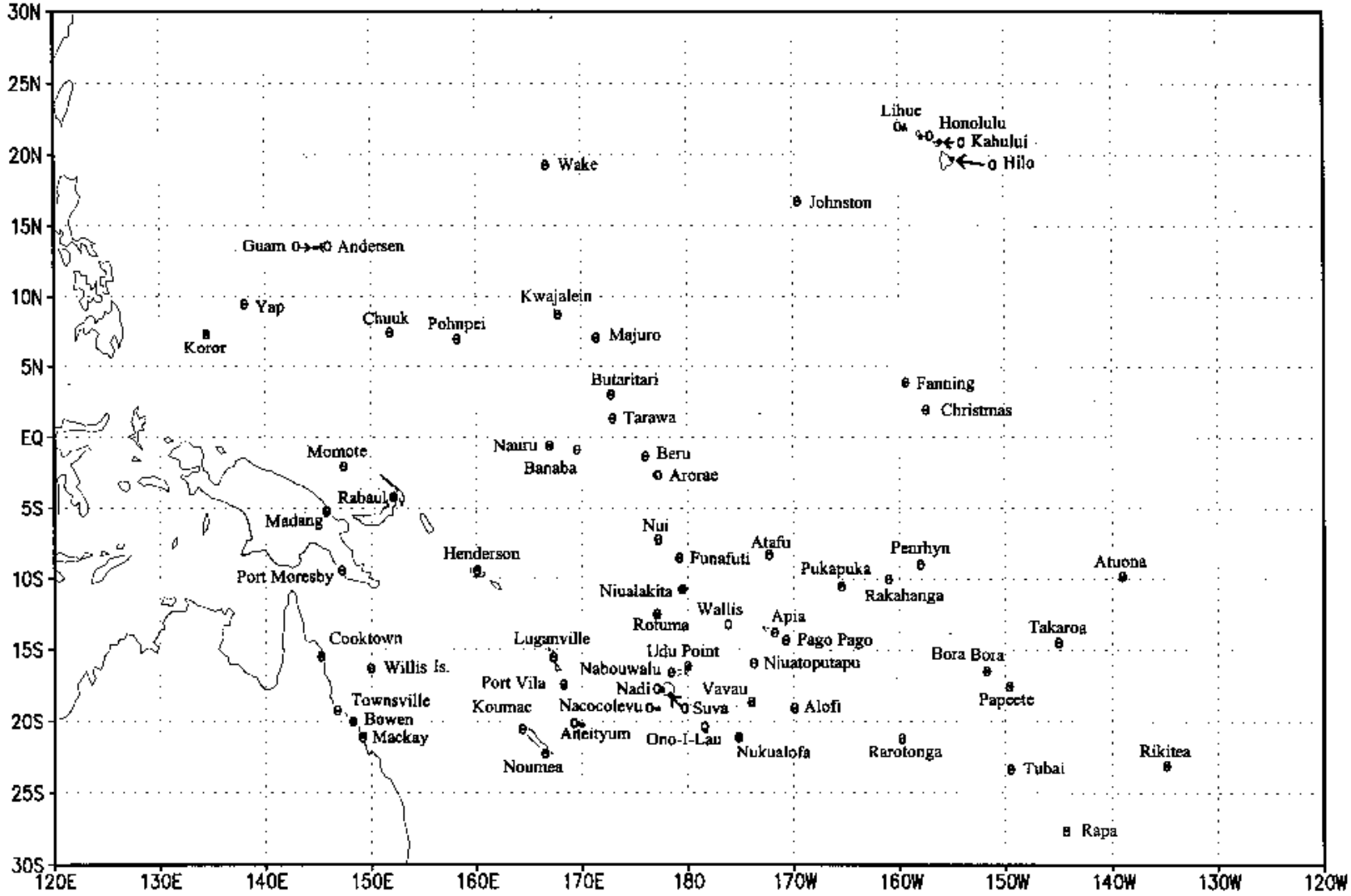
Baseball Sized Hail in Action

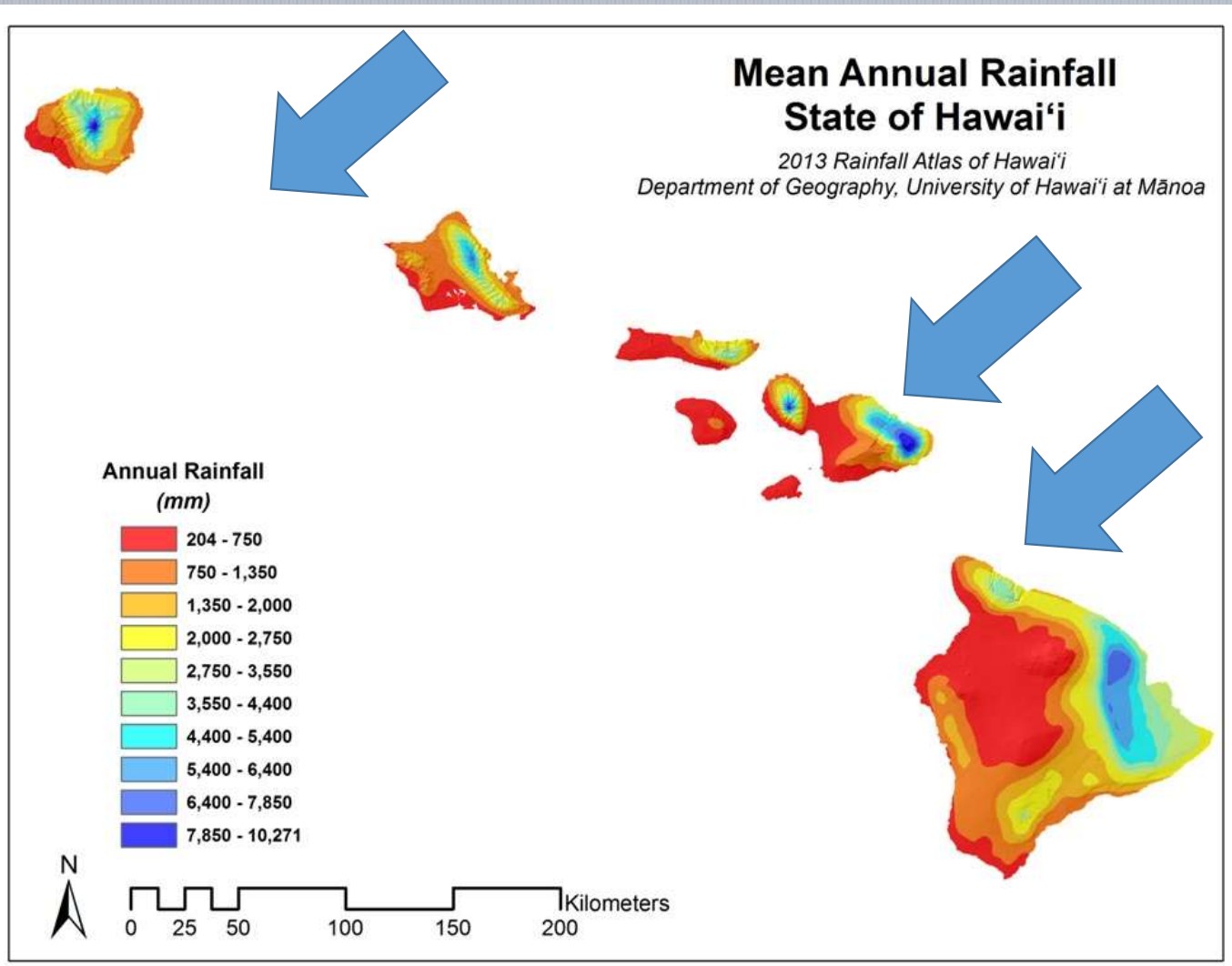
Pacific Ocean Precipitation Distribution



- **ITCZ** = Intertropical Convergence Zone
- **SPCZ** = South Pacific Convergence Zone
- **Convergence** results in increased cloud formation and precipitation.

RAINFALL STATIONS FOR PACIFIC ISLANDS





State of Hawai'i Precipitation

- Notice the increase in rain on the **windward** side of the islands?
- Notice the **rain shadows** on the **leeward** sides of the islands?
- **What direction does the prevailing wind come from?**