

Poll Question

W Which location has a colder winter

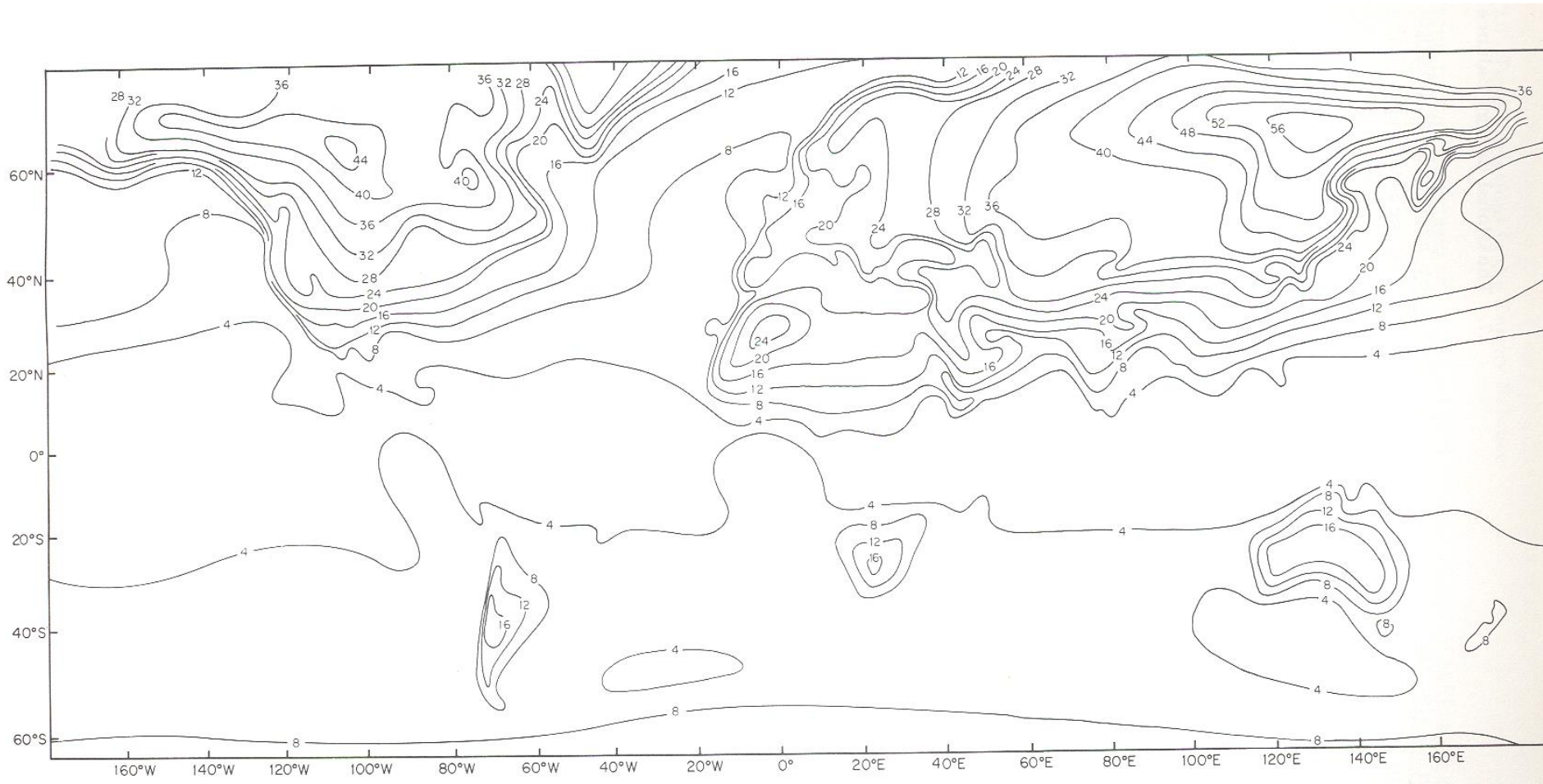
When poll is active, respond at [PollEv.com/joelathornto254](https://poll-ev.com/joelathornto254) Text **JOELATHORNTO254** to **22333** once to join

Prince Rupert British Columbia (53N)

Omaha Nebraska (41N)

Total Results: 0

Rorschach Test?



Questions

- **Why is Seattle a milder climate than Boston? (Seattle is if anything further north)**
- **Why can I drive 1 hour from the coast and be much hotter than at the coast in the summer?**
- **What causes torrential rain for days/weeks in places like India, Southeast Asia and even SW N. America during certain seasons?**

Atmosphere-Ocean Couplings

- 1. Heat Exchange**
- 2. Mass Exchange (water and carbon cycles)**
- 3. Momentum Exchange (surface wind stress)**

Land/Ocean Contrasts

Ghostly Continents

Contours show difference between average summer and winter temperature: $T_{\text{summer}} - T_{\text{winter}}$

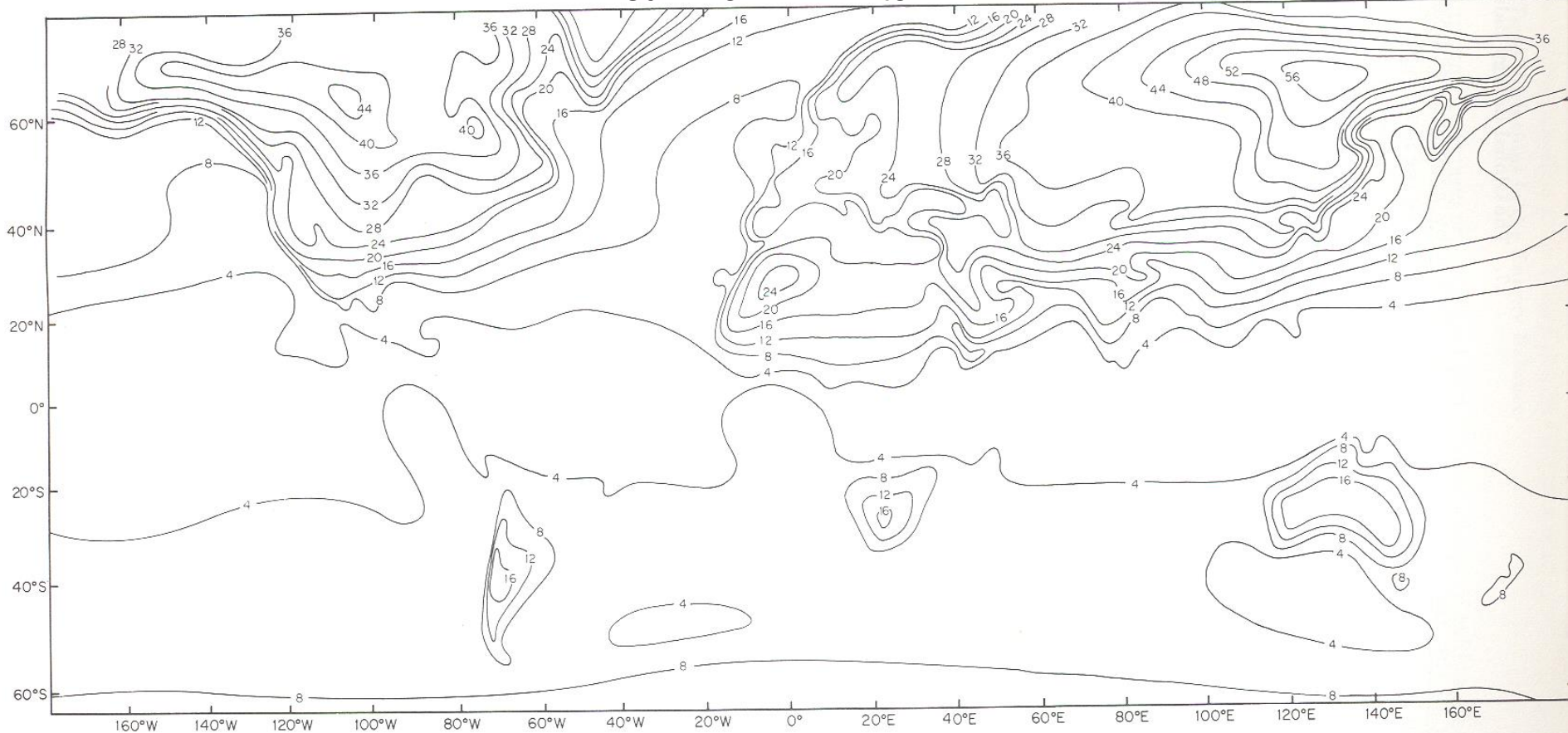


Fig. 7.20 The “Find the Continents” game! Annual range in temperature at the earth’s surface, in degrees Celsius. (Adapted from a figure by A. S. Monin and P. P. Shirshov which appeared in Report No. 16, *GARP Publications Series*, World Meteorological Organization—International Council Scientific Unions, p. 203.)

Ghostly Continents

Contours show difference between average summer and winter temperature: $T_{\text{summer}} - T_{\text{winter}}$

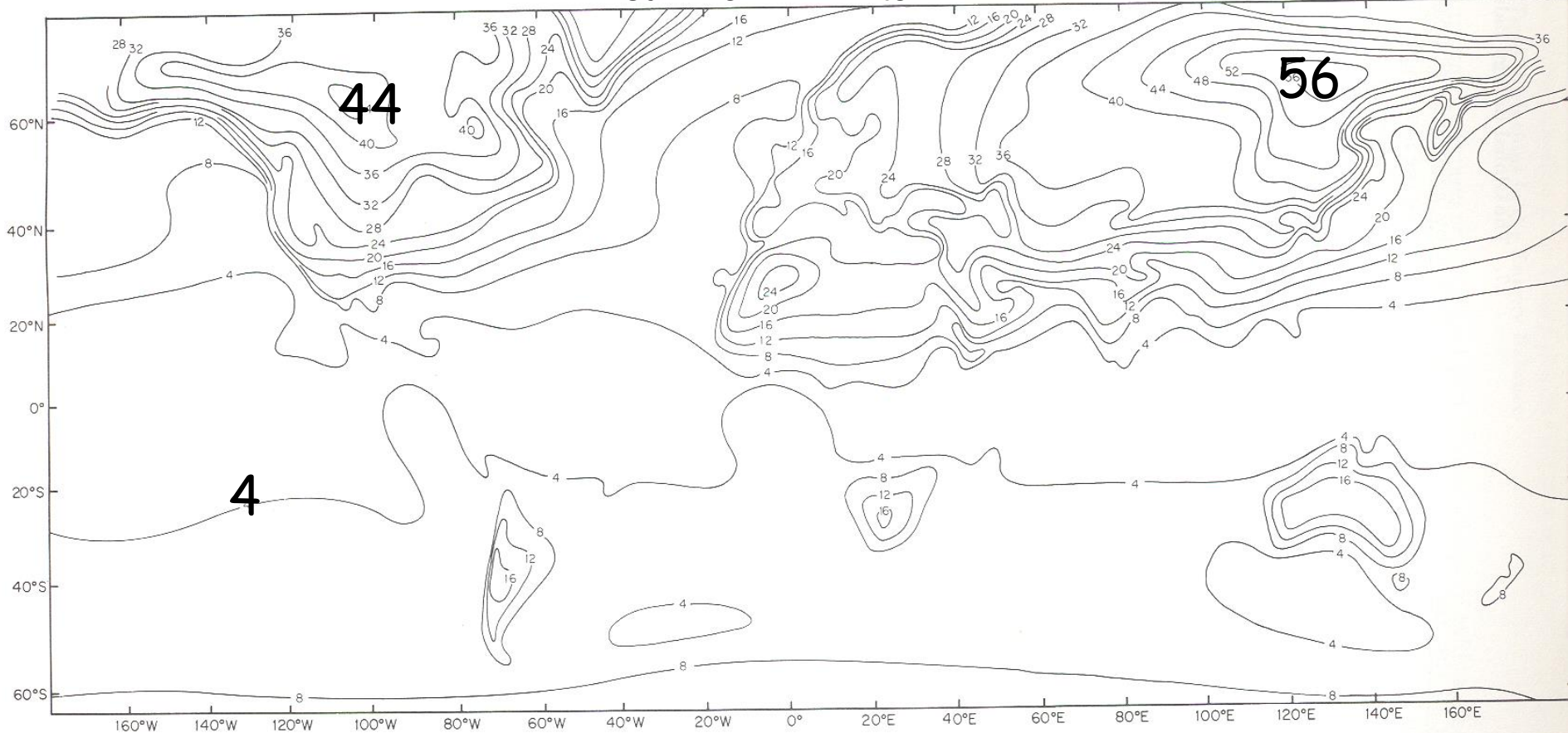
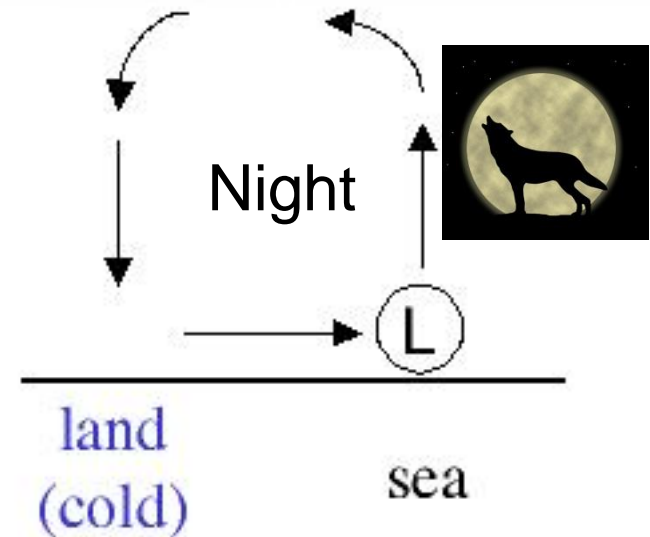
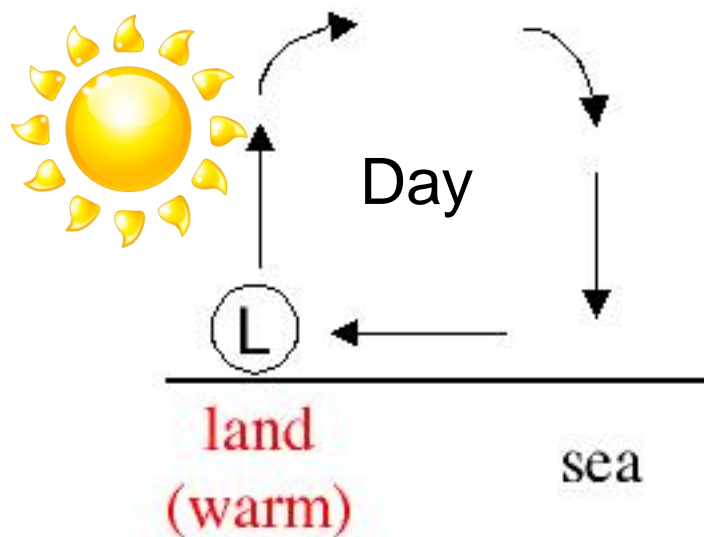
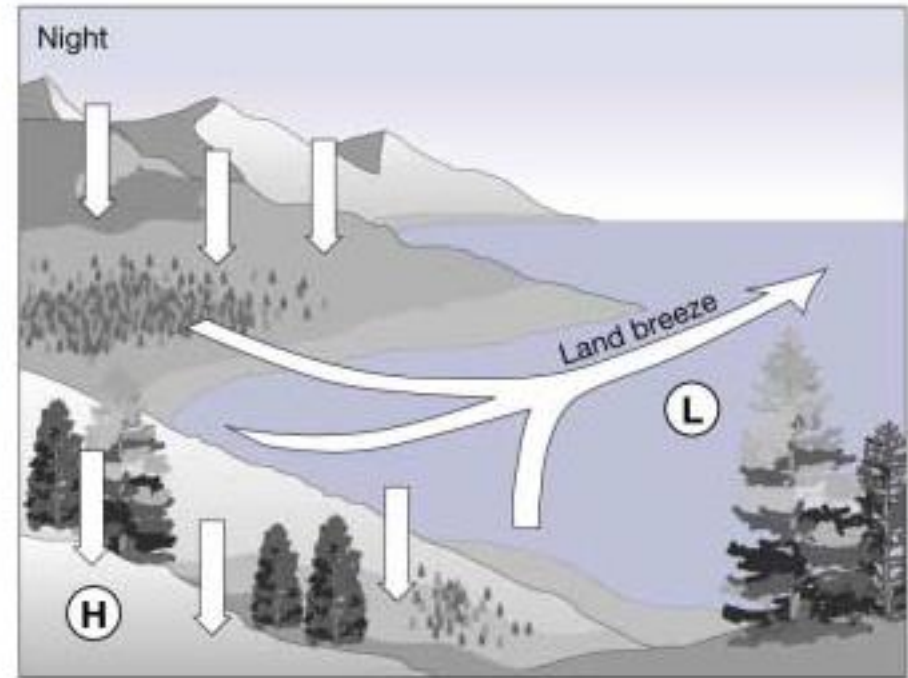
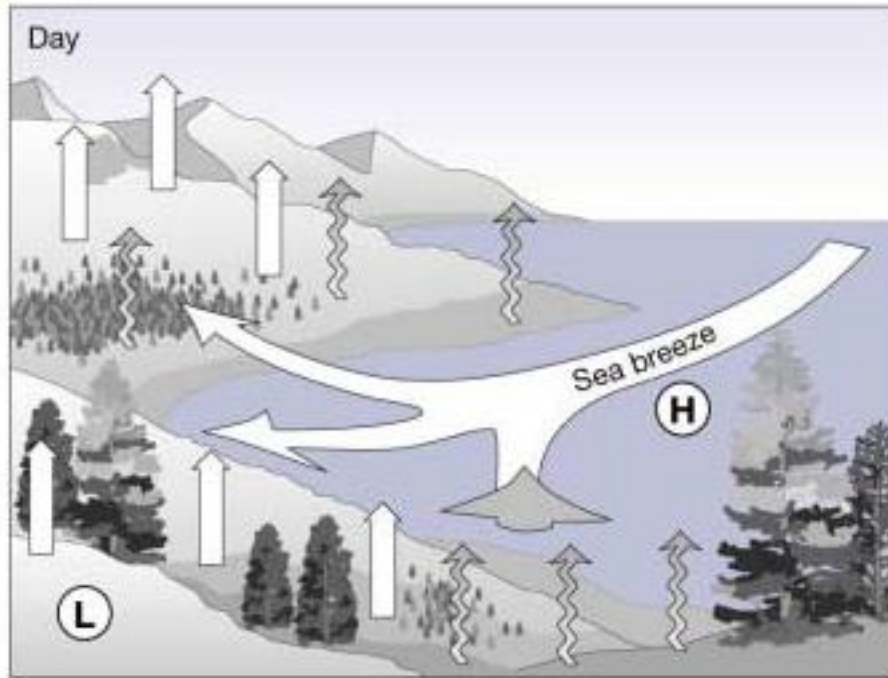


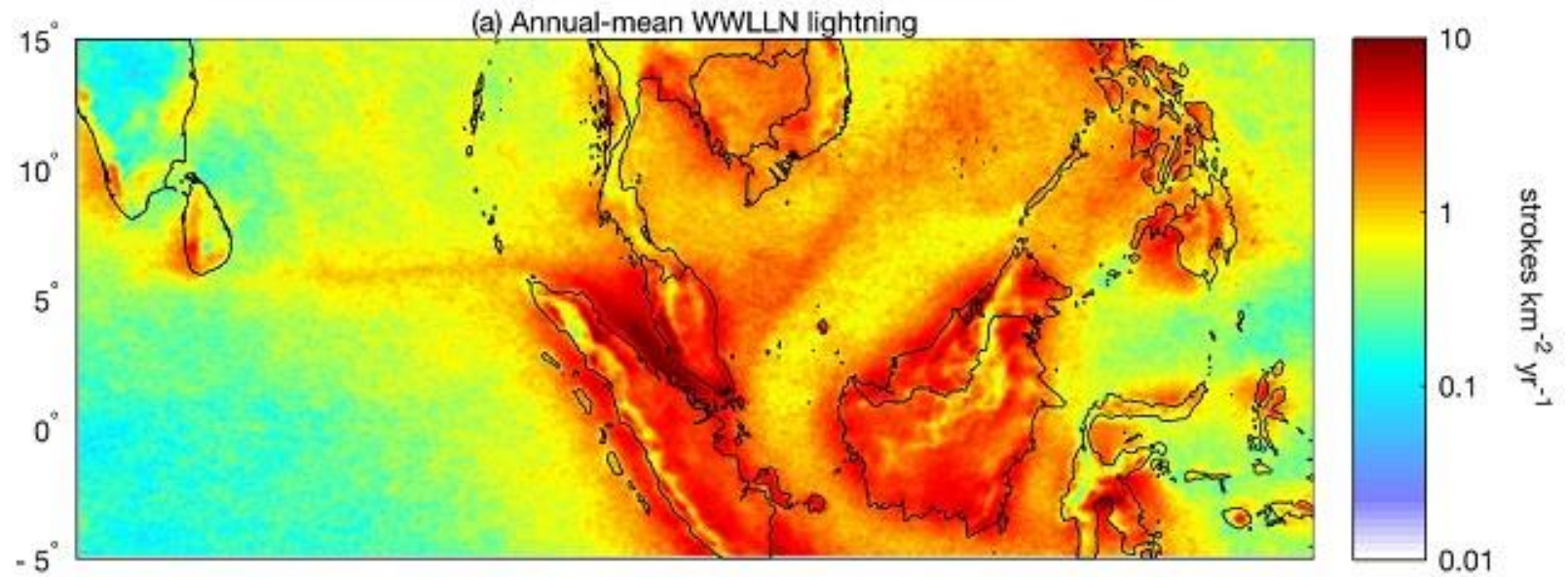
Fig. 7.20 The “Find the Continents” game! Annual range in temperature at the earth’s surface, in degrees Celsius. (Adapted from a figure by A. S. Monin and P. P. Shirshov which appeared in Report No. 16, *GARP Publications Series*, World Meteorological Organization—International Council Scientific Unions, p. 203.)

Continentality → Heat Capacity & Westerly Flow

Coastal Climates: Diurnal (Daily) Sea Breeze

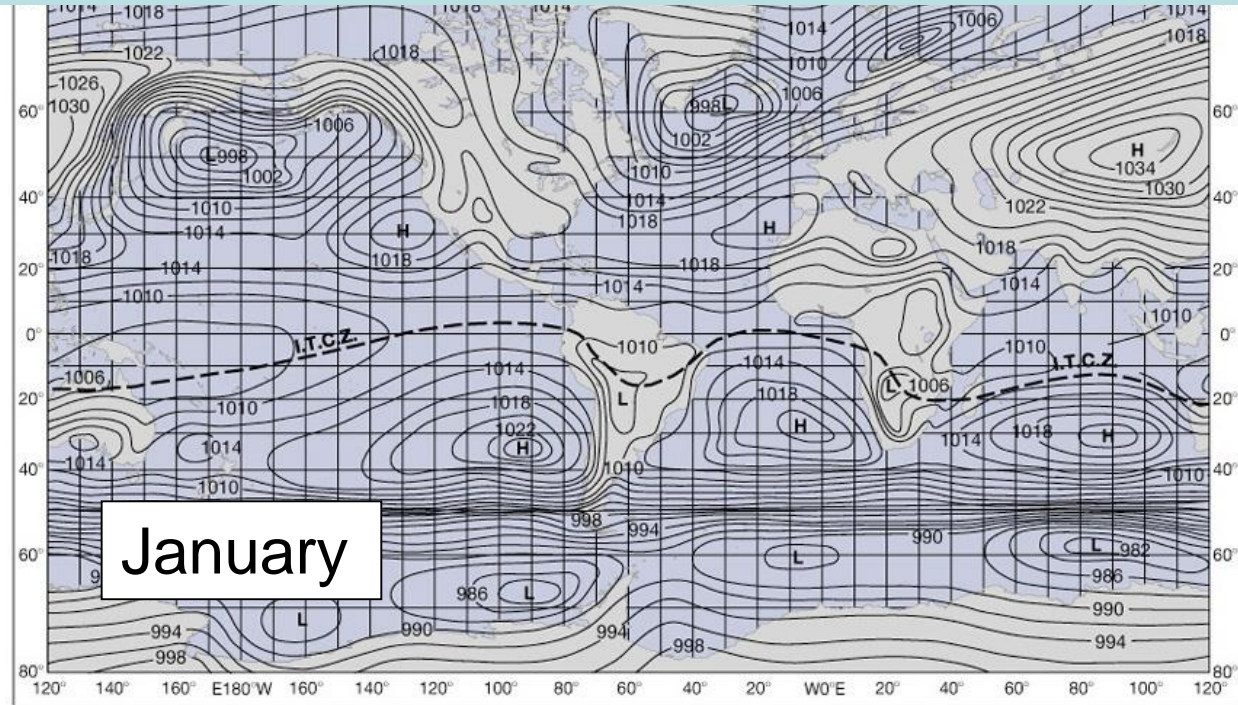


Lightning enhanced over coastal areas

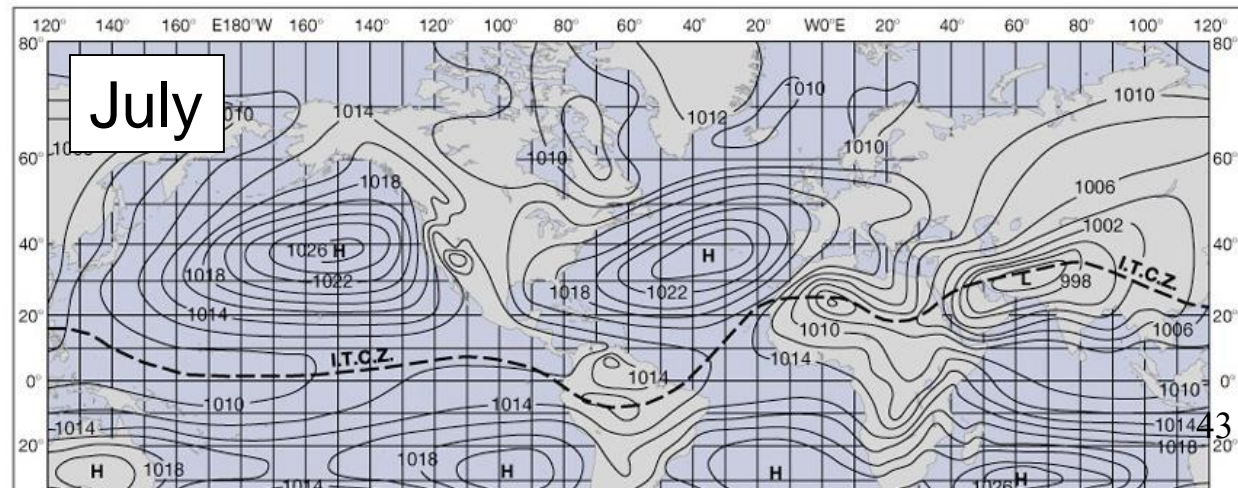


Monsoonal Circulation

Similar to diurnal sea breeze but on larger spatial and temporal (seasonal) scales.

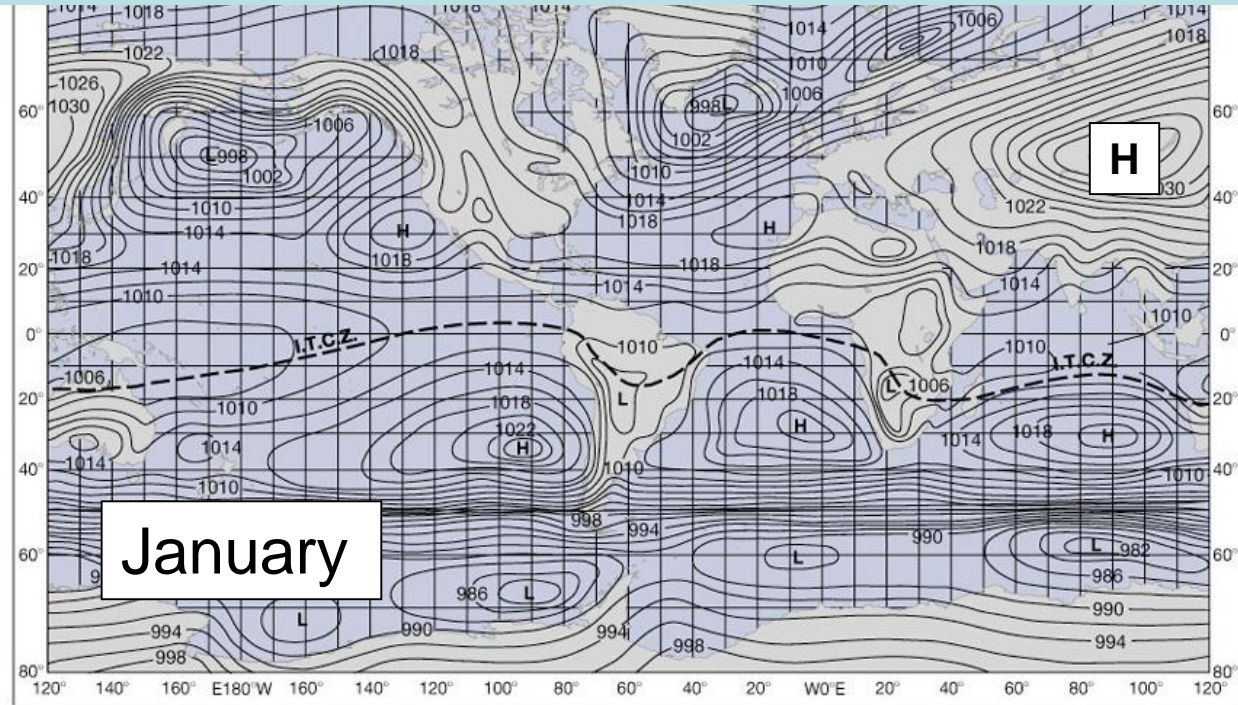


(a)

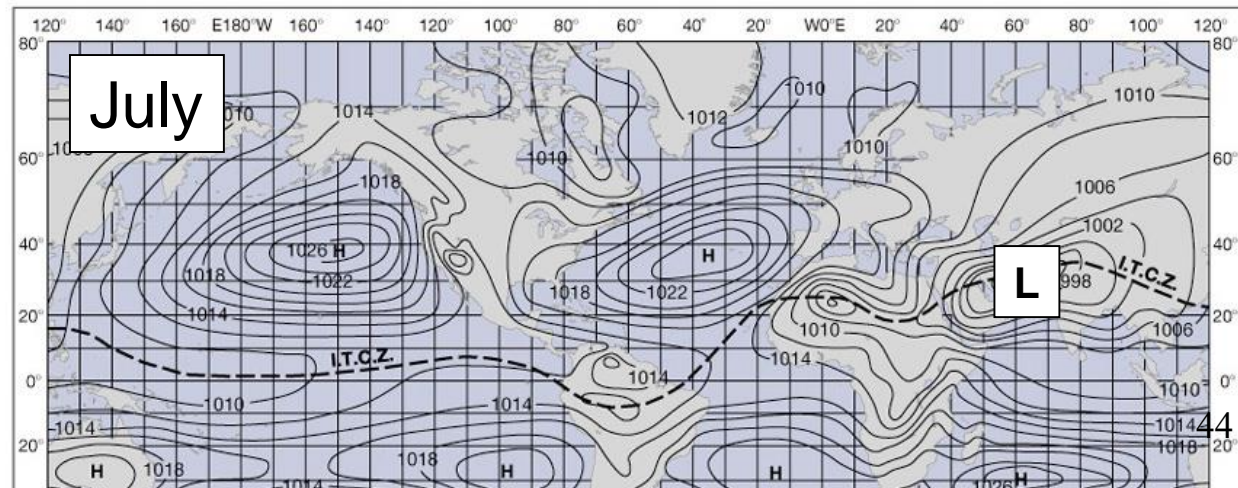


Monsoonal Circulation

Similar to diurnal sea breeze but on larger spatial and temporal (seasonal) scales.

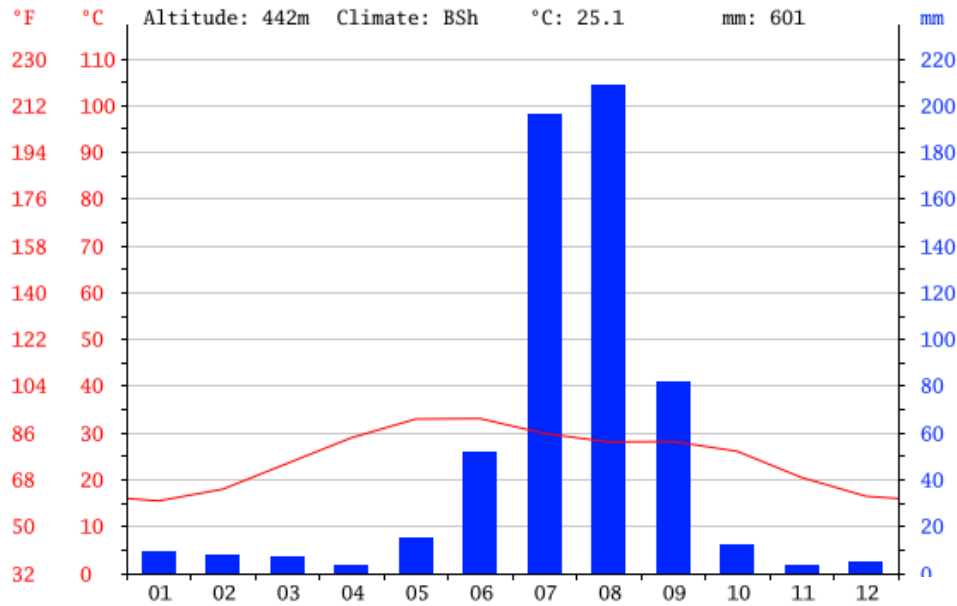


(a)



Monsoonal Circulation

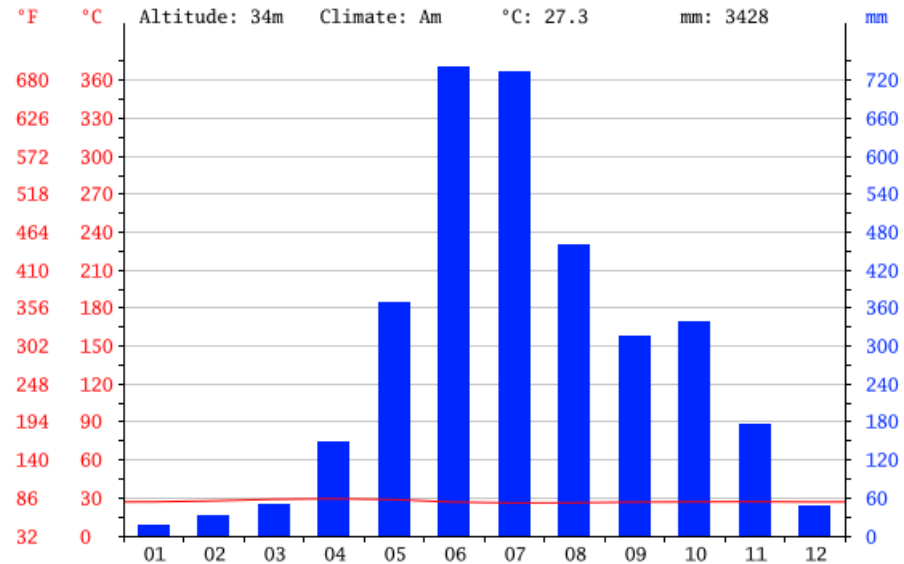
Rainfall in Western India



Jaipur (NW India)



Kolenchery (SW India)



Monsoonal Rain

Monsoon Rain

<https://www.youtube.com/watch?v=bETUbu7pXgs>



Poll Question

W Pollution from India, China, etc enhances airborne particulate matter, which contributes to haze. Haze acts like clouds, increasing albedo.

When poll is active, respond at PollEv.com/joelathornto254 Text **JOELATHORNT0254** to **22333** once to join



Pollution has amplified monsoonal circulation

Pollution has suppressed monsoonal circulation

Total Results: 0

Land/Ocean Contrasts Summary

Ocean has higher heat capacity and thermal mass over which to distribute heat

Oceans heat and cool more slowly and overall less than land for same energy input
→ climate is moderated over oceans; more extreme seasonality over land

Contrast in surface heating gives rise to:

- 1. Diurnal Sea Breeze**
- 2. Continentality**
- 3. Monsoon Circulations**