LACEMOPS – Controls on Climates

The climate of a particular place is controlled by a variety of geographic and atmospheric forces operating at that place.

Latitude
Air Masses
Continenity and Marine Effects
Elevation
Mountain Barriers
Ocean Currents – Hot or Cold
Pressure Cells
Storm Tracks
Latitude and Temperature

Figure 5
Heat Leaving the Earth Shows Importance of Latitude

(b) Longwave energy flux to space.
Arctic Sea Ice Changes

1979

2007

Figure HLC
Air Masses Originate in Different Climatic Regions and, Therefore, Have Different Characteristics
Map Showing Effects of Continentality
Interiors of North America and Asia
Have a Large Annual Range of Temperature
Continentality Implies a Large Seasonal Range in Temps. Marine Implies Minimal Seasonal Changes in Temp

**Land–Water Heating Differences**

**CONTINENTALITY**
- Temperature conditions more extreme—land warms and cools rapidly
- Less evaporation (lower latent heat)
- Land has a lower specific heat
- Land has no mixing between layers

**MARINE**
- Temperature conditions more moderate—water warms and cools slowly
- Greater evaporation (higher latent heat)
- Surface is transparent
- Water has a higher specific heat
- Water has mobility and mixes in vast ocean currents

Figure 5
Marine and Continental Climates: San Francisco vs. Wichita

Figure 5.13
Marine and Continental Climates: Vancouver vs. Winnipeg

Figure 5.12
Elevation – The Higher the Elevation the Cooler the Climate
La Paz, Bolivia at 13,400 ft. Is Much Cooler than Concepción at 1608 ft.

### Altitude

![Map of South America showing La Paz and Concepción](image)

<table>
<thead>
<tr>
<th>Month</th>
<th>La Paz, Bolivia</th>
<th>Concepción, Bolivia</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
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<tr>
<td>A</td>
<td>16º 15' S 62º 03' W</td>
<td>16º 30' S 68º 10' W</td>
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**Station**

<table>
<thead>
<tr>
<th></th>
<th>La Paz, Bolivia</th>
<th>Concepción, Bolivia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Latitude/longitude</strong></td>
<td>16º 30' S 68º 10' W</td>
<td>16º 15' S 62º 03' W</td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
<td>4103 m (13,461 ft)</td>
<td>490 m (1608 ft)</td>
</tr>
<tr>
<td><strong>Avg. ann. temperature</strong></td>
<td>9ºC (48.2ºF)</td>
<td>24ºC (75.2ºF)</td>
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<tr>
<td><strong>Ann. temperature range</strong></td>
<td>3ºC (5.4ºF)</td>
<td>5ºC (9ºF)</td>
</tr>
<tr>
<td><strong>Ann. precipitation</strong></td>
<td>55.5 cm (21.9 in.)</td>
<td>121.2 cm (47.7 in.)</td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td>810,300 (Administrative division 1.6 million)</td>
<td>10,000</td>
</tr>
</tbody>
</table>

*Figure*
Mummy Mountain, RCNP, Shows Effects of Elevation in Vegetation Patterns
Mountains Are Very Effective Barriers to the Movement of Moisture. Some of the Wettest Places in the World are on the Windward Side of Mountains While Some of the Driest are on the Leeward Side
Average Annual Rainfall on Hawaii

- Northeast Trade Winds
- 300 in.
- 175 in.
- 20 in.
- 10 in.
Ocean Currents – The Gulf Stream Carries Warm Water Toward Europe
California Surfers Have to Fight the Cold Water of the California Current
The Dynamics of High and Low Pressure Cells Causes Frequent Changes of Weather in the U.S.
The Westerlies Push Cyclones and Anticyclones Across the Country
The Storm Track for Hurricane Ike Shows How A Single Hurricane Can Affect The Caribbean and A Lot of the U.S.
Hurricane Ike
Over Cuba
I-45 Near Galveston After Hurricane Ike