

MOUNTAIN CLIMATOL: REVIEW, PART 2

A. TOPOCLIMATE/MICROCLIMATE:

- **SCALES**
- **FACTORS**
 - SLOPE (orientation, angle, curvature)
 - SKY VIEW, SHELTER
 - LOCAL AIRFLOW
 - SURFACE RADIATIVE PROPERTIES (albedo)
 - SOIL THERMAL PROPERTIES

- **MODELLING SLOPE RADIATION** (sun path diagram, geometry)
 - APPLICATIONS

- **TOPOCLIMATES**
 - THERMAL BELT
 - ‘SHELTER’ – local, large scale

MICROCLIMATE

- RADIATION
- WIND EXPOSURE, SHELTER
- SNOW DEPTH
- VEGETATION
- SOIL PROPERTIES

B. CLIMATIC CHARACTERISTICS

1. **ENERGY BUDGETS** – $R_n = S(1-\alpha) + L_{\downarrow} - L_{\uparrow}$

$R_n = H + LE + \epsilon$ – Niwot examples

EVAPORATION – OBS. (Pan, Lysimeter, Eddy Correlation)

- **CALCULATION**

- Aerodynamic (profile)

- Energy Budget

- (note: $H/LE = \beta$)

- **TYPICAL BUDGETS – wet/dry surfaces**

2. **CLOUD REGIMES**

- Lapse rates

- Bergeron (feeder/seeder)

- Convective, stratiform clouds

3. **PRECIPITATION**

- **OBS. ERRORS, NETWORKS**

- Precip. Types (equatorial, tropical, midlat)

- Orographic Component

- Processes

- Models – condensation rate, vertical motion

- Snowfall, - Snow transport (modes)

- Condensation – RIME; fog precip.

- Snow Sublimation

C. BIOCLIMATE:

I. WEATHER HAZARDS

- 1. HYPOXIA – physiological/medical aspects inspired oxygen,
working capacity, hemoglobin saturation,
cardiac output**
- 2. HYPOTHERMIA, WINDCHILL**
Vaso-constriction/dilation
Basal metabolic rate
- 3. OTHER – Blowing snow/white-out; avalanche, lightning strike**
Foehn – pressure waves

II. INDIGENOUS POPULATIONS

- Adaptations – to hypoxia (Tibet, Peru, Colorado)**
- Acclimatization – athletes, climbers**
- Loss of ventilatory adjustment (Soroche CMS)**
- Effects of altitude – health, births**

D. REGIONAL CASE STUDIES

BASIC ROLES OF:

LATITUDE – annual/diurnal T-range

Global Wind Belts (surface, upper air)

Continental/Maritime

1. EQUATORIAL/TROPICAL

NEW GUINEA – seasonal wind changes (SE/NW)

Precip. – decrease with height

Snowfalls at 4km

VENEZUELA – Dominant E'lies

Complex precip. Profiles

Max. at 1km on E-slope of Andes

Thermal-Biome zones

Cloud forest

Glaciers 5 km

HIMALAYA – Summer monsoon

Precip. Max. in foothills (decr. to N and W)

Circulation Change – ocean/Tibet roles

Winter cyclones in NW Himalaya

Mountain snowfall, large glaciers

REGIONAL CLIMATES (continued)

Tibet – ‘Plateau Monsoon’ (Compare to S.W. USA high plateau) – summer heat low (shallow)

Precipitation decreases from SE to NW

Mostly summer convective precipitation (nocturnal)

Mean altitude 4500 m – extensive permafrost

MID-LATITUDES

Basic controls: westerlies, storm tracks; latitude maritime/continental effects.

“snow climates” in Pacific NW, Colorado . . .

- 1.) Colorado Rocky Mountains – west/east contrasts in precipitation gradients.
 - a. Strong westerly winds
 - b. Topoclimates-esp. low elevation
- 2.) Alps – dry interior regions.
 - a. Contrasting annual precipitation regimes (mainly N/S)
 - b. Foehn effects
- 3.) Scottish Highlands – ultra – maritime. Steep precipitation gradient to west.
 - a. Short and variable snow season