

# MOUNTAIN CLIMATOLOGY: 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

## A. CLIMATIC CHARACTERISTICS

### 1. ENERGY BUDGETS – $R_n = S(1-\alpha) + L? - L?$

$$R_n = H + LE + \epsilon \quad - \text{Niwot examples}$$

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, - OROG. COMPONENT
  - Processes
- Models – condensation rate, vertical motion
- Snowfall, - Snow transport (modes)
- Condensation – RIME; fog precip.

## **A. BIOCLIMATE:**

### **I. WEATHER HAZARDS**

- 1. HYPOXIA – physiological/medical aspects inspired oxygen, working capacity, hemoglobin saturation**
- 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**

### **III. POLLUTION**

**Emission – Transport – Deposition**

**Types/sources**

**Plumes – wind/stability effects**

**Large-scale – Synoptic Weather - Inversions**

**Mixing Depth: convection**

**Orog. Effects: Channeling**

**Flow blocking/Separation**

**Slope/Valley Airflows**

**Scavenging/Seeder-feeder role**

**Orog. Clouds**

**Acid rain/Snow**

## **A. 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-Blome 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**