REVIEW 1

MAIN TOPICS:

1. SCALE CONSIDERATIONS:
   Topo and regional climate:
   Observations in mountains; observatories
   Weather and climate observations – instruments and networks

2. EFFECTS OF LATITUDE, CONTINENTALITY:
   ON RADIATION, TEMPERATURE
   Radiation and temperature increases equatorward
   Diurnal range decreases poleward
   Continentality – incr annual range of temp.

3. ALTITUDE EFFECTS:
   PRESSURE
   \)
   ) EXPONENTIAL DECAY
   WATER VAPOR

RADIATION * SOLAR - OPTICAL DEPTH - CLOUDS
(U.V.) SCATTERING (Rayleigh, Mie)
5-15% increase /Km altitude for clear skies
- INFRARED – decrease with altitude, both up and down
- NET small increase with altitude

TEMPERATURE : : ELR. 6.5K/Km DALR (9.8K/Km) - reversible
SALR - variable < DALR (not reversible):
POTENTIAL TEMP. – T of air brought DALR to 1000 mb pressure

SUMMIT vs. FREE AIR – Summits warmer on calm sunny afternoons (1K)
PLATEAUS elevated plateaus warm upper troposphere more
   Compare winter night on peak, limited and extensive plateaus
MASS ELEVATION tree and snow line rise in interior of mt ranges; less cloud, warmer summers

AIR/SOIL TEMP. GRADIENTS: larger annual range in soil

WIND –
11 BERNOULLI acceleration, FRICTION form drag  
Speeds generally less over mountains than free air

SPEED – UP OVER LOW HILLS – Boundary later effects

2. R. LONG (1955) Lab experiments; FROUDE No. criterion

\[ Fr (\text{Froude No.}) = \frac{\text{Inertial Forces}}{\text{Buoyancy}} = \frac{\text{(Vicous)}}{\text{(Gravitational)}} \]

\[ Fr = \frac{U}{N \cdot h} ; \quad \text{ALSO} \quad = \frac{U}{h(S)T^2} \]

\[ Fr < 1 : \text{BLOCKED} \]

\[ Fr > 1 : \text{SHOOTING FLOW} \quad \left[ \frac{1}{\lambda} = \frac{U}{S} \right] \text{Scorer Parameter} \]

\[ \text{for Lee Waves} \]

Note  Brunt Väisälä Frequency for natural vertical oscillations \( N = \sqrt{S/2\pi} \)
\[ S \quad \text{(STATIC STABILITY)} = g(\Gamma-\gamma)/T \]

3. J. HUNT & SNYDER (1980) Lab experiments; ‘Dividing Streamline’ Concept

Critical Streamline height for flow over obstacle is:

\[ H_s = h (1 - F) \]
OTOGRAPHIC EFFECTS

PRINCIPLES OF FLOW OVER MOUNTAINS –

- K.E. REQUIREMENT \((0.6U / S^{1/2})\)
- FROUDE No. CRITERION – BLOCKING

SCALES:

PLANETARY – CONSERVATION OF POTENTIAL VORTICITY

SYNOPTIC – FRONTS slowed
- BARRIER WINDS turn towards low pressure upwind
- LEE CYCLOGENESIS Alps, Rockies

Meso Scale
- FREE FORCED WAVES
- LEE WAVES – SCORER PARAM.
- KARMAN WORTEX STREET

Dynamically – FORCED WINDS

(BARRIER WINDS)
- FALL WINDS – CHINOOK (FÖHN): 2 processes T incr, RH decr
- BORA T decr
THERMALLY - FORCED SCALES:  (DENSITY GRADIENT, g)

- SLOPE WINDS – ANA/KATABATIC
- MOUNTAIN/VALLEY WINDS
- MOUNTAIN - PLAINS WINDS
- THERMO-TIDAL WINDS (MOUNTAINS / PLAINS)