PASSIVE MICROWAVE REMOTE SENSING

VAC/Fall

2/3

PASSIVE MICROWAVE REMOTE SENSING.

(L.S. 8.20 p. 720)

Passive Microwave system - another "Look" at the environment.

It is different from Radar.

System here donot supply 'illumination' (energy) but sense naturally available microwave energy within the field of view: e.g. ~~Sa~~ sun, surface materials.

Operation is similar to thermal radiometers.

eg: blackbody radiation principle is used: usage of radiometers and scanners.

Differs with thermal MSS - by using sensors with Antenna and not photon detection elements of Th. R.S. scanners.

2. a. Passive MW system. operate in the same spectral region of radar system (1mm - 1m) - mostly within the shorterwave length region of radar (1m - 30cm)

b. also & operate low energy TAIL of the 300K Blady radiation curve typifying terrestrial features. In this spectral region — all objects in natural environment emit MW Radiation - but faintly. - It includes terrain elements and atmosphere.

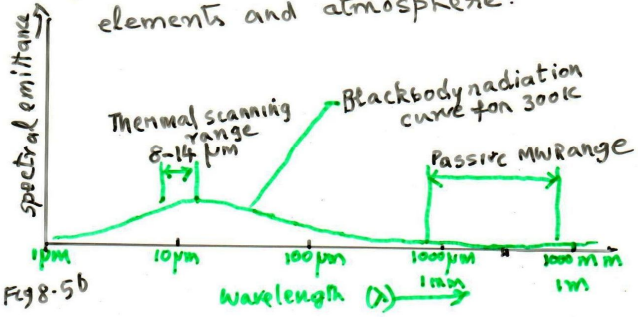

Fig 8.5b

Comparison of spectral regions for thermal versus passive MW sensing

2/3 PASSIVE MW (cont'd)

Passive MW composed of number of source components.
→ some emitted, some reflected and some transmitted.
A passive MW signal include (1) EMITTED COMPONENT - from surface temperature and materials of the surface object
(2) EMITTED component from the atmosphere.
(3) surface - reflected component from sunlight and skylight
(4) transmitted component of subsurface origin.

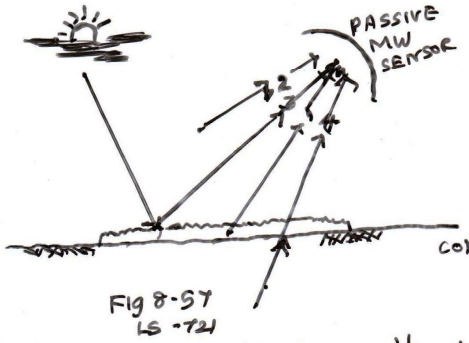

Fig 8-57 LS-72

SIGNAL COMPONENTS
1- emitted from object (2) emitted ~~from~~ by atmosphere
3. emitted from surface
4. transmitted from subsurface

components of a Passive MW signal

In short, intensity of passive MW Radiation over an object ∞ objects temperature, incident radiation and also emittance, reflectance and transmittance properties of the object.
In addition, it is also influenced by the object's surface electrical, chemical and textural characteristics, bulk configuration and shape and Angle of viewing.
signal - weak magnitude and noisy as compared to others
∴ Interpretation is more complex.
Even then, it is found useful from measuring atmospheric temp. profiles to analysing subsurface variation in soil, water and mineral content.
Both airborne and satellite systems exist

AIRBORNE PASSIVE MICROWAVE RADIOMETER

PASSIVE MW (cont...)

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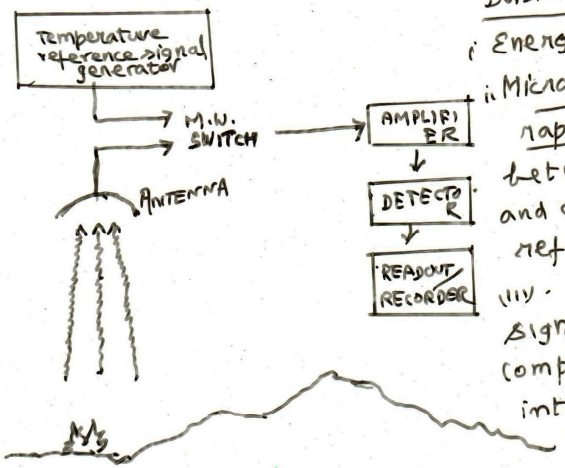
AIRBORNE PASSIVE MW RADIOMETER:



RADIOMETER (PMW)

Basic configuration

i. Energy - collected at Antenna

ii. Microwave SWITCH - permits rapid alternate sampling between antenna signal and caliberation temperature reference signal.

iii. Low strength antenna signal is amplified and compared with that of the internal reference signal.

(iv) Difference between antenna signal and reference signal is electronically detected and input into some mode of read out / recording.

like radiometer designs - the trade of between antenna beam width and system sensitivity - comparitively a large antenna beam width is required - characterised by low spatial resolution and weak signal.

Output is non-imaging, profiling type these are digitally recorded on a magnetic tape/medium.

PASSIVE MW SCANNERS. Improved image output - obtained by SCANNING MW radiometer. In this, antenna field of view is scanned transverse to the direction of flight. - performed mechanically, electronically or by using multiple antenna array

APPLICATION - i. Metereology - atmospheric temp, atm. water, ozone

ii. Oceanography seaice, currents, winds, oil pollution even in trace amounts

iii. snowmelt, soil temp & moisture

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