ROLE OF GROUND WATER IN HYDROLOGICAL CYCLE

HDROLOGICAL CYCLE

GROUND WATER

PREPARED BY

K. BIJENDRA PRATAP RAHI

GUEST FACULTY,P.G. DEPT. OF GEOLOGY,
PATNA UNIVERSITY, PATNA

HYDROLOGICAL CYCLE

- WATER IS CONSTANT ON EARTH
  - QUANTITATIVE
  - QUALITATIVE

  HIGHEST LIQUID WATER ON EARTH

  OCEAN: 97%

  ICE SHEETS: 3%

  <1% FRESH WATER

  G.W.: 21%

WHAT IS HDROLOGICAL CYCLE

- SET OF PROCESSES FOR MOVEMENT OF WATER AMONG RESERVOIRS
  - EXMPLE:
  - OCEAN ___ ICE SHEETS
  - RIVER____BASE FLOW
  - WATER VAPOUR_ PRECIPITATION

MOVEMENT OF WATER

- ATMOSHPHERE
- LAND
- UNDERGROUND

GROUND WATER

- WATER OCCUR BELOW ZONE OF SATURATION
- MOVE VERTICALLY AS WELL AS LATERALLY
- INFLLUENT & EFFLUENT CONDITION

OCCURRENCE OF GROUND WATER

- POROUS FORMATION
  - (PRIMARY POROSITY)
- FRACUTRES
  - SECODARY POROSITY

MOVEMENT OF GROUND WATER

- HDRAULIC GRADIENT
- CONTOUR PATTERN
- DENSITY
- FORMATION
- TRACER STUDY AND STUDY OF CONTOUR

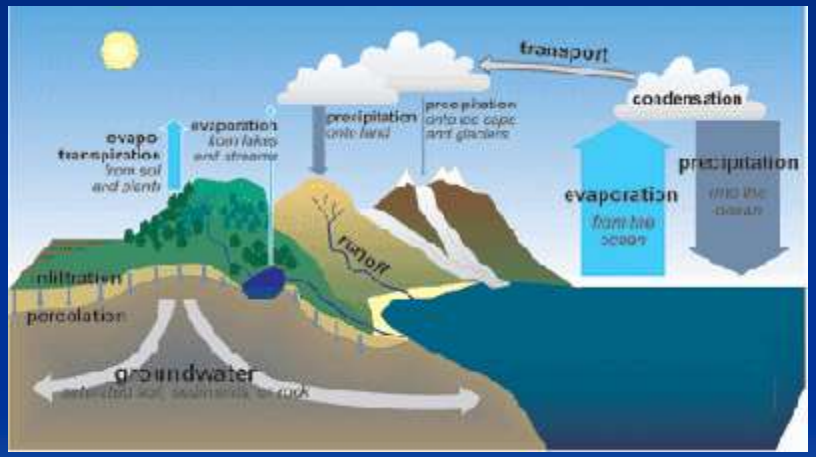
GW VIS-À-VIS H.CYCLE

- QUANTIFICATION AS BASE FLOW
- EVAPOTRANSPIRATION
- CAPILLARY WATER AS SOURCE FOR PLANTS PHOTOSYNTHESIS
- WATER LEVEL:
  - INFILTRATION
  - EVAPOTRANSPIRATION

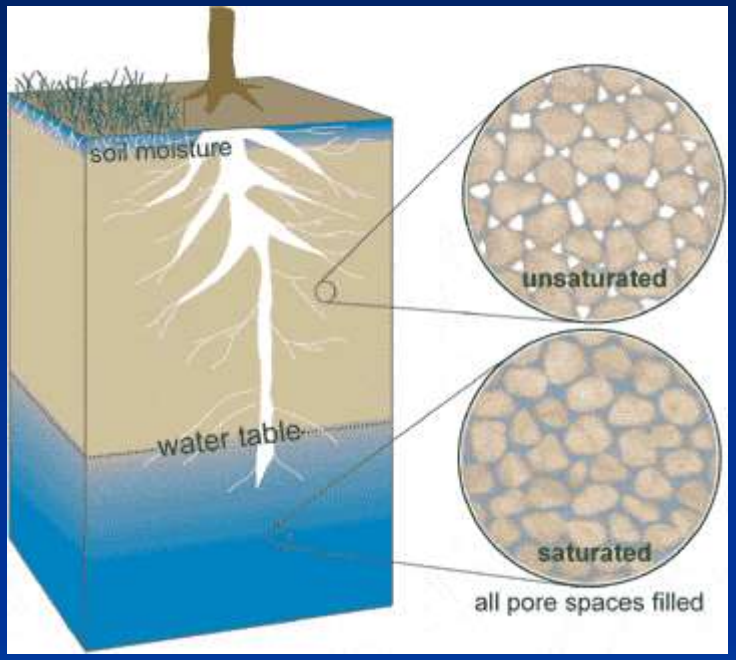
G.W. BUDGET

- PRECIPITATION
- BASE FLOW
- INFILTRATION
- INDUCED RECHARGE

H.CYCLE


transport
condensation
precipitation
evapo transpiration
evaporation
precipitation
evaporation
runoff
infiltration
percolation
groundwater

GW OCCURRENCE



CONTROLS OF GEOLOGY ON G.W. OCCURRENCE

- GEOLOGY
  - LITHOLOGY
  - STRCTURES
    - PRIMARY
    - SECONDARY

LITHOLOGY

- PRIMARY ROCKS/ FORMATION
  - SEDIMENTRY ROCKS
    - UNCONSOLIDATED SEDIMENTS: SAND/SILT,CLAY, GRAVEL
    - SEMI-CONSOLIDATED SEDIMENTS
      - CUDDALORE SST., LATHI SST.
    - CONSOLIDATED SEDIMENTS:
      - MASSIVE SANDSTONE/ LIMESTONE
        - VINDHYAN SST.

SECONDARY (HARD) ROCKS/ FORMATION

- IGNEOUS ROCKS
- METAMORPHIC ROCKS

IGNEOUS ROCKS

- PERMEABILITY DUE TO FRACTURING AND WEATHERING
  - 2-4 FOLD INCREAMENT IN PERMEABILITY
  - WEATHERING UPTO 100MBGL

GW OCCURRENCE & DISTRIBUTION

- BELOW GROUND SURFACE/ ZONE OF SATURATION
- OCCURS IN PRIMARY POROSOITY
- SECONDARY POROSITY

POROSITY

- POROSITY: RATIO OF VOLUME OF VOIDS/ TOTAL VOLUME
- PRIMARY
- SECONDARY
  - PRIMARY: INHERENT CHRACTER OF ROCKS
  - SECONDARY: SUBSEQUENT PROCESS

CONTROLS ON POROSITY

- SHAPE AND ARRANGEMENT OF CONSTITUENTS GRAINS
- DEGREE OF SORTINGS
- CEMENTATION AND COMPACTION
- FRACTURING
- DISOOLUTION

DISTRIBUTION

- G.W. DISTRIBUTED UNEVENLY IN TIME
  - AND SPACE
  - IT IS DISTRIBUTED MORE IN RECENT SEDIMENTS THAN ANY GEOLOGICAL AGE
  - IT IS MORE ABOUNDANT AS STATIC RESOURCE THAN DYANAMIC

MODE OF OCCURRENCE OFG.W IN DIFFERENT G.TERAINS

- PENNISULAR PART
- EXTRAPENINSULAR PART
- INDOGANGETIC PLAINS

PENNINSULAR PART

- CRYSTALLINE ROCKS
- SECONDARY POROSITY
- WATER LEVEL
  - MBGL
  - DISCHARGE (POTENTIAL)

THANK YOU