Fluvial systems – meandering rivers
 Rio Solimoes, Brazil  synthetic aperture radar
Characteristics of meandering rivers

generally confined within one major channel

secondary channels active during floods

wide valley,
channel is a small part of entire valley
Characteristics of meandering rivers

Compared with braided river:

- low gradient
- greater sinuosity
- greater % suspended load (less bedload)
- finer-grained sediments
- more constant discharge (usually perennial flow)
Meanders, San Joaquin River

cohesive banks, little coarse sediment
Meanders, Sacramento River (transitional)
less cohesive banks, moderate coarse sediment
Amazon River meanders
an extreme in bank stability (short-term)
Scroll plain

Rio Apure, Orinoco Basin
Meanders and scroll plains
Cross section of river valley & channel

River valley

Active river channel
A natural river valley
Landforms

Note: levees along outside of meanders
Meandering and sinuosity

Path of highest-velocity flow
Point bars

lateral
accretion of
point bars

along inside of meander
Cut bank and point bar

Deposition

Erosion

Oxbow lake
Cut bank, Fountain Creek, New Mexico
Point bar, upstream
Fountain Creek, New Mexico
Point bar, downstream
Fountain Creek, New Mexico

Flood channel
Enhanced turbulence at confluence
Features of a meandering river

Figure 5.12a
Meander cut-off
Forming an oxbow lake
Overbank deposition

*Bankfull discharge*

flood water level up to the top of the channel maintains the primary channel occurs once every 1-2 years
Overbank deposition

predominantly vertical accretion  
(erosion is minor)

lower velocity than channel

finer-grained sediments

**Main features:**
- Levee
- Floodplain (floodbasin)
- Crevasse splay
- Oxbow lake
Natural levees

rapid loss of water velocity over bank
deposition of sand and fine sand
Natural levees

mostly on outside of meander

deposition of med sand near channel, then fine sand and coarse silt

ripple marks or laminae of fine sand / silt
Crevasse splay during flood
Note levees clearly defined
Crevasse-splay deposit (after flood)
Deposits graded vertically and laterally
Crevasse-splay deposits
Bryants Creek, breach in man-made levee
Crevasse splay – larger scale
Columbia River
River avulsion – switching channels

Development of an avulsion
Avulsion and meander belts

2000 BP
- Channel belt with existing river channel
- Presumed river course (eroded)
- Older channel belt

1000 BP
- Present Waal and Meuse
- Eolian river dunes
- Coversand

Scale: 5 km
River terraces – something changed
Concept of base level

Hypothetical balance between erosion, transport, and deposition
Profile of Fox River from A to B

Elevation (above sea level)

Distance (downstream)

(b) Longitudinal profile
Effect of regional uplift

Equilibrium profile

How does the river respond?

River erodes down

Land surface uplifted
Effect of regional subsidence

Equilibrium profile

River fills in the hole

Land surface subsides
Effects of changing base level

- Downstream erosion caused by lack of sediment
- Deposition of sediment in the new basin