MSL Landing Site

Layered Sedimentary Rocks: History of Environments

Stratigraphic Sections: History of evolving sedimentary environments. Suite of sedimentary features and geochemical information in vertical sections for geological context.

Variety of rock types and paleoenvironments: increase chances of finding signs of water and life/biomarkers.

Thick deposits: Longer history, higher probability that biosphere developed.

Multiple lines of evidence for hydrosphere and biosphere: outcrop, textural, chemical, isotopic.

Age: Younger deposits have less chance of degrading.

Fresh Exposures/outcrops: Less probable cover by wind and gravity flow deposits.
Less degradation of primary deposits and potential biomarkers.

Certainty of sedimentary origin? Involvement of water?

Advantages of evaporites/saline environments:

Can be biologically productive environments (saline lake).

Good chance of biomarker preservation: brines, water body stratification.

Organic matter preserved for long periods WITHIN crystals.

Low porosity/permeability- organic materials sealed in beds.

Advantages of clays/mudstones:

Can accumulate in biologically productive environments

Organic materials co-deposited with fine grained sediment.

Low permeability- good preservation.

Ideal Site: Evidence for prolonged surface water or standing body of water.

Subaqueous deposits interbedded clay/mudstone AND evaporites.

Formation in center of perennial lake, or in marginal delta areas.

Best preservation of organic matter: rapid deposition or stratification of water column.

Deposition of extrabasinal sediment during flooding events and intrabasinal chemical and biological sediment.

Example: **Eocene Green River Formation**, the world's largest oil shale deposit, Piceance Creek Basin, Colorado, (diameter ~75 km, 600 m thick), 1.5 trillion barrels of in-place shale oil.

Mostly **perennial saline lake deposits-** Interbedded evaporites, carbonates, and mudstones, and organic matter on millimeter to multi-meter scale.