

Geography Foundation

24/sep/24

Geomorphology

12:00 - 2:15 / Lec 18

Slope Development Theories -

1] Slope Decline Model by Davis ✓

2] Slope Development Model by Penck ✓

• Penck named convex slope as Boschung / Bosche
↳ concave slope as Haldenhang (German names)

3] L.C. King Theory -

• He studied S. African & Savannah landscape which have semi arid & drier conditions

• Theory in 1940's

• L.C. King Model = Hybrid Model (He had used concepts & virtues of many models & more extensively)

used ideas from Davis, Penck, A. Wood

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◦ from Davis he took following ideas -

- * Cycle
- * stage based changes
- * Climate doesn't matter
- * 2 savannah & dry conditions are normal
- * Upliftment is imp., Erosion starts after upliftment is over

◦ From Penck he took following ideas -

- * slopes are \neq (endogenic & exogenic processes acting together)

(This seems bit contradictory because his model is actually cycle of erosion like that of Davis)

- * Acknowledges the role of structure in slope changes
- * Like Penck, L.C King also says slopes would form from below to top.

◦ From A. Wood ÷

- * A. Wood Model is more about how ^{face} develop & role of ^{plate} tectonics

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deposition. L.C King asserted that scarp face plays a very imp role in the process of slope evolution.

For L.C King, basal sapping process is very efficient with instantaneous removal of deposits, ~~because of which~~ from foot of slopes because of which slopes retreat backward parallelly

L.C King says, his model will not operate without vertical scarp face which are "normal slopes & very common slopes in dry savannah conditions & deserts"

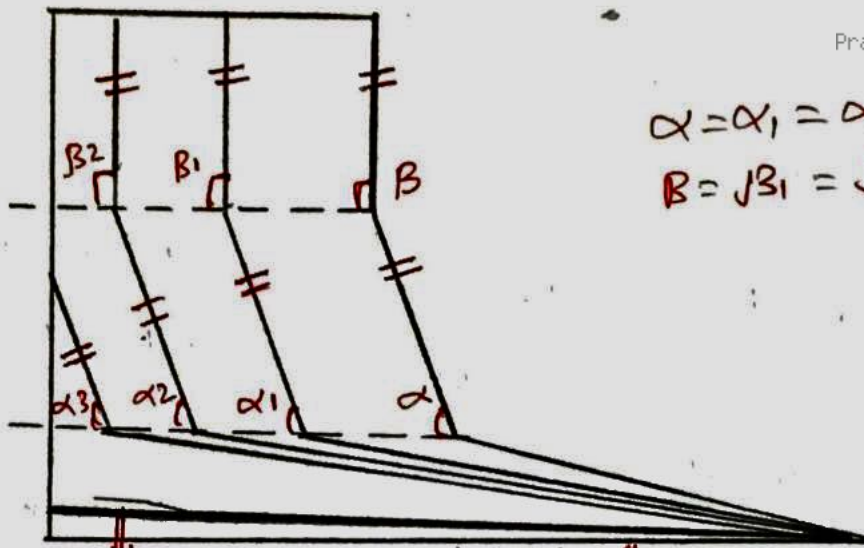
Acc. to L.C King, slope evolution is the product of ÷

1] Parallel scarp retreat

2] Pediplanation (Pediplain & Pediment)

↳ v.v gentle sloping & very extensive erosional plain at foot of scarp Mt. & common in Dry & Savannah landscape

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$$\alpha = \alpha_1 = \alpha_2 = \alpha_3$$

$$B = \beta_1 = \beta_2$$

Rediment / Rediplan of L.C. wing

- o Slope Retreat Model / Parallel Retreat Model /
Epigene Cycle of slope / Savannah Cycle
of Erosion \div

Because there is a sharp fall in climate conditions are dry, basal rapping is very efficient so slopes change such that all the slopes are replaced by new slopes that have the same slope angle & same slope length except for lower most segment that becomes progressively gentler and rougher

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o Unlike Davis Model, slope angle declines with age & final angles are always gentle angle.

o In case of Penck's Theory & more in terms of L.C. King's Theory, older land slopes can have steeper slopes & vertical scarp faces

o Following are stages acc. to L.C. King

Stage 0 - Sudden upliftment of land, once upliftment stops, then erosion starts.
(Like Davis, L.C. King refers to stage of prolonged erosional stability)

Youth stage - Rapid erosion
- valley floor has irregularities
- More vertical cutting
- Deep valleys
- Inselbergs start forming →
(Inselbergs are also called as Bornhardt or Castle koppie)

Mature stage

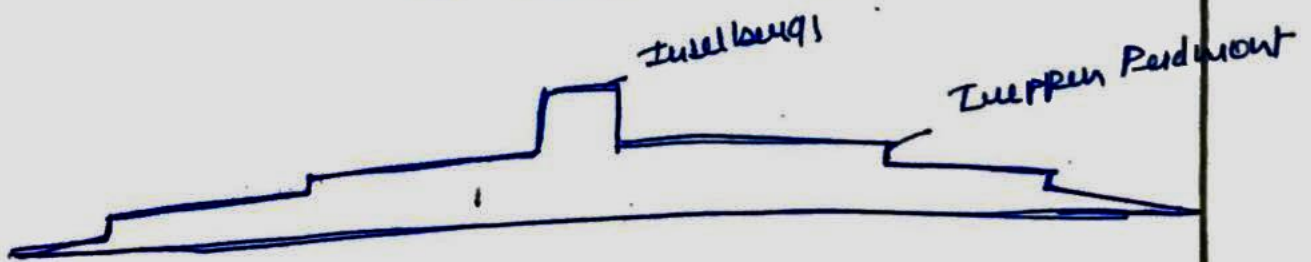
- Valley Deepening slows down
- Lateral erosion is more
- Slope retreat becomes more pronounced
- Land scape starts flattening.

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Old stage

- Inset basins are very small & in some cases they get eroded
- Extensive flat plains called as Pediment / Pediplain
- Pediplain may have some cuts with small elevation which are called as Treppen Piedmont

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4] Equilibrium Models - (after 1960's)

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- They are more inspired by Penck's Process Theory, they are time-independent theory
- They explain slopes & Lf as products of interacting Endogenic & exogenic processes.
- They see slopes as natural adjustments for removal of sediments.

5] Stoahler's Equilibrium Theory

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• Acc. to Stoahler, slope steepness is not because of age of slopes or landscape. Young slopes can be gentle while older slopes can also be steep.

• Slopes adjust acc. to need to remove sediments. Slopes which have more sediments & lack vegetatⁿ & slopes that have less sediments.

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Reference pg 289 (Geomorphology by SS)
 Concept of Stoahler.

pg 284 - A. Wood Model

pg 279 - Slope Replacement Theory of Penck
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pg 277 - Davis Model (Slope Theory)

pg 268 - Type of Slopes

pg 72 - 73 L. C. King Model
 (Chapter 3)

PYQ (Previous Year Questions)

Ques Discuss views on slope development provided by L. C. King (2009) (20M)

Ques Write short note on: System's Approaches to Landform Analysis (2012) (20M)

Ques Explain how Boscche & Holdenhayn lead to Theory of Slope Replacement (2012) (20M)

Ques Answer following: Characteristics of standard Epigene Cycle of erosion (2012) (20M)

Ques In explaining concept of Pediplanation, King combined the ideas of Davis, Penck, Wood with his own. Elaborate (2016) (20M)