An aerial photograph of a coastal dune system. The foreground and middle ground are dominated by rolling, light-colored sand dunes. Interspersed among the dunes are several dark, forested areas, likely composed of coniferous trees. In the background, a range of dark, forested mountains stretches across the horizon under a clear sky. The overall scene depicts a natural coastal landscape.

Timing and emplacement of coastal dunes between Florence and Coos Bay, OR

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2000**

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Introduction

- Increasing pressures from recreation, wildlife, housing, and aesthetics
- About 45% of the coast is active or vegetated dunes
 - These landforms have specific concerns: slope stability, GW resources, and wetlands
 - No comprehensive study to address many concerns
 - Researchers generally have speculated about origin of dune sands — off record
 - Lack of knowledge about the origin, ages, and stratigraphy of the upland dunes

Study area

- Coos Bay dune sheet
- South-central coast of Oregon
- Located in the Oregon Dunes National Recreation Area (ODNRA)
- Dune sheet runs from Heceta Head (just north of Florence) to Cape Arago (just south of Coos Bay)
- 70 kilometers long and up to 5 km wide
 - Visible from space



Space view



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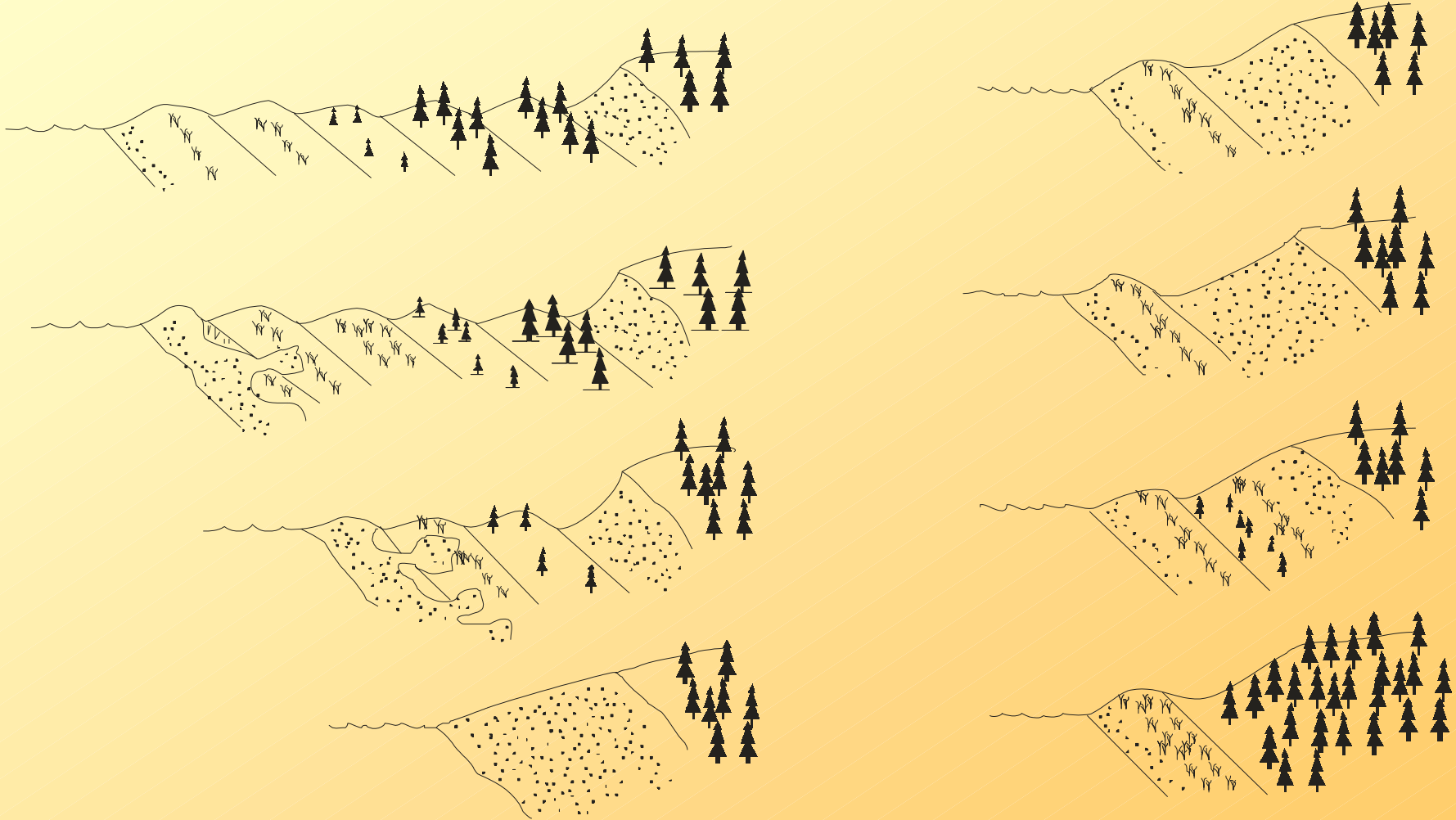
Background

- Cooper (1958)
 - General study of the dunes, made broad statements about morphology and formation
- Others - more specific
 - Hydrology, soils, stabilization
- Other papers
 - Sand mineralogy, clay mineralogy, sediment mechanics, paleoclimate

Two working ideas of emplacement

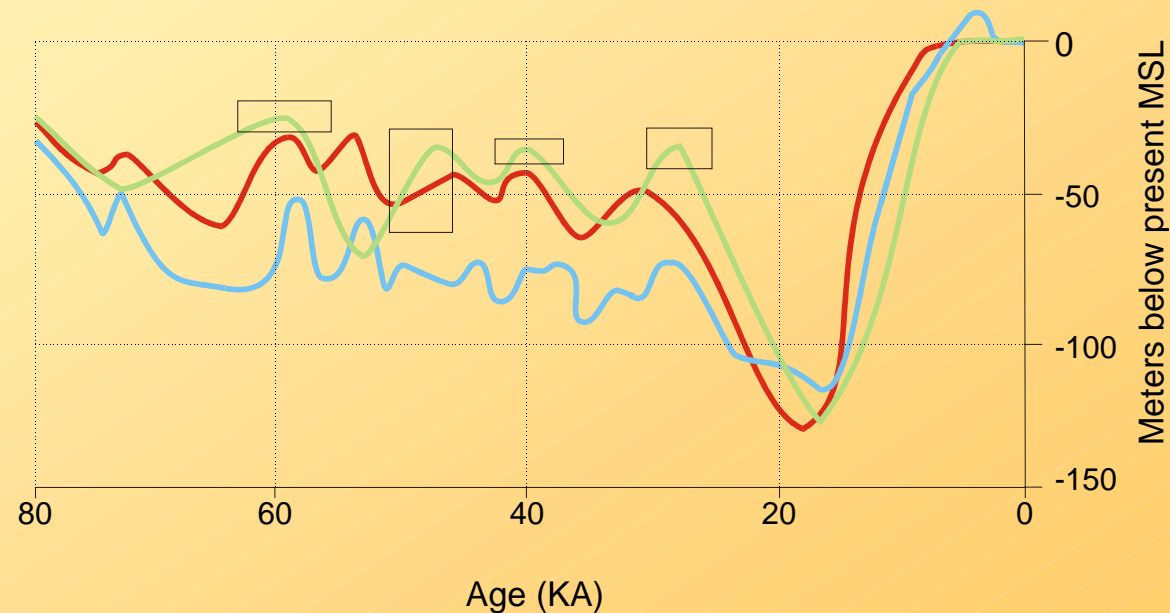
- High stand model
 - This was the assumed mechanism
 - Involves a rising sea forcing sand eastward over the shelf

High stand model



Two working ideas of emplacement

- High stand model
 - This was the assumed mechanism
 - Involves a rising sea forcing sand eastward over the shelf
 - This model would produce Holocene dates



Age (KA)
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Low stand model

- Model involves a regressing sea exposing the continental shelf
 - The exposed shelf allows sand and silt to blow inland
 - The sediments are deposited on a “receptive” shoreline
 - This model would produce late Pleistocene and early Holocene dates

Methods

- Dating methods are primarily thermoluminescent dating
 - Involves the measurement of decreasing energy levels in electron shells of quartz and feldspar grains
 - The procedure dates the last time the grain was exposed to light
 - This is perfect since we are interested in dune stability
 - The ideal would be to get a basal date at the sand/bedrock interface

Sample collection

- Three ways
- Vibracoring
- Cutslope
- Sand auger



Results

- Dates were older than expected
 - 5,000 ybp was expected
 - The oldest date was 37.2 ± 4.8 ka

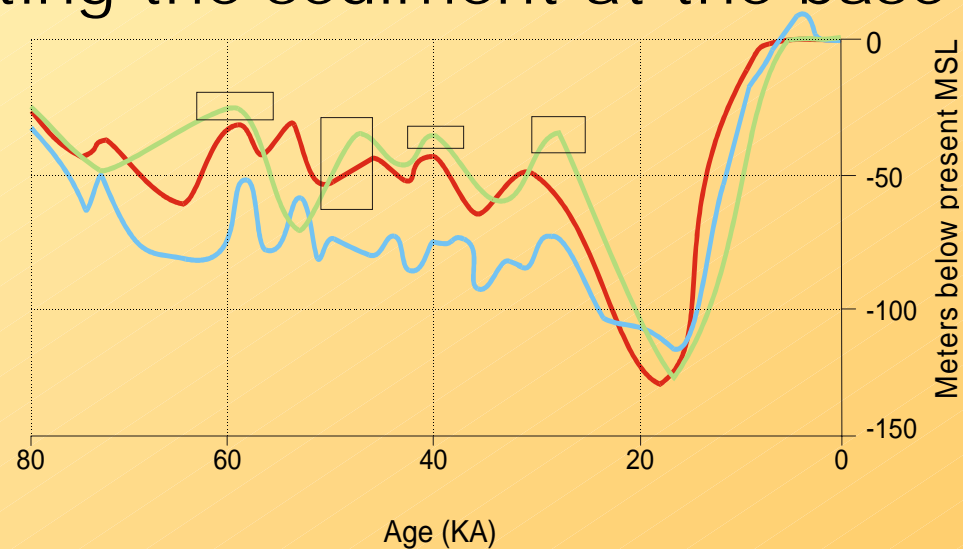


Results

- Wide range of dates
 - From 4.7 to 37.2 ka
- These dates reject the assumed high stand forcing model
 - A combination of both the high stand and low stand models are possible

Interpretations

- The combination high-low stand model
 - The mini high stands could have forced sand up the shelf
 - The sea then regressed, abandoning the beach and dune sands in the middle of the shelf
 - Wind then forced the sand up the remainder of the shelf, depositing the sediment at the base of the Coast Range



Restrictions

- Additional TL dating is being performed now
 - These new dates could place additional restrictions on possible models

Conclusions

- The dunes are not strictly Holocene features of ~5,000
 - They *do* date back to the Pleistocene
- The emplacement model is not as simple as previously thought
- The very presence of the active dunes is of importance
- Additional work needs to be done to confirm/reject this model for the remainder of the West Coast