Title
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Data Availability
The data associated with this publication are available upon request.
Seasonal Changes in Sand Level and Wave Energy on Southern California Beaches
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Introduction
- Investigate seasonal variability of sand levels in Southern California
- Sand levels: LIDAR and in-situ surveys at two focus sites
- Waves: regional network and numerical model
- GPS Sand Level Observations
  - Back beach to waterline
  - Vertical accuracy ~10 cm
- Monthly in-situ surveys since 2000
- Focus sites at Torrey Pines (~7 km) and San Onofre (~3 km)
- Increased temporal resolution

Wave Observations
- Wave observations combined with numerical model
- Hourly estimates every 100 m alongshore
- Alongshore variability in wave field due to offshore islands
- Southern California Wave Field: Dec. 21, 2004

Focus Sites
- San Onofre Beach 3km
- Torrey Pines Beach 7 km
- 3 LIDAR surveys/year
- Spatial Amplitude of First EOF
- Temporal Coefficients of First EOF
- Monthly In-situ Surveys

GPS Sand Level Observations
- 8 LIDAR flights since 2002
- Survey 79 km, extended to 170 km
- High spatial resolution (multiple points per square meter)
- Seasonal cycle winter erosion (↑) and summer accretion (↓) with significant alongshore variability
- Seasonality of volume change (85% variance) and wave energy (99% variance)
- Greater variability in volume change fluctuations
- Accretion with decreased wave energy (H↓)
- Erosion with increased wave energy (H↑)

Finding the Waterline:
April 2004
- Goal: Compare LIDAR processing to regions where ATV data is available
- ATV-LIDAR divergence is most offshore acceptable LIDAR data point
- Using LIDAR tide level, and wave height to define waterline

Conclusions
- Primarily seasonal cycle in sand level fluctuations: summer accretion when south swell is predominant and winter erosion when north swell is predominant
- Considerable alongshore variability, with three times as much elevation change at Torrey Pines than at San Onofre
- Seasonal volume change and wave energy correlated at the focus sites, but not over the 79 km section
- In general, more variability in seasonal volume changes than seasonal wave field
- Larger sand grain size at San Onofre and elsewhere could contribute to difference
- Future work investigating the influence of grain size (and cobbles), beach width, and wave obliquity

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