CERES Directional Models: Albedo vs. Solar Zenith Angle

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Objectives

- Create directional models of albedo as a function of solar zenith angle and scene type
  - Shape is more important than absolute albedo
- Use models for albedo interpolation
  - Biggest effect is on non-GEO means
- Ensure consistency with CERES ADMs

Model Sources

- Direct integration from ADM
  - Good, but sampling limitations
- Theoretical Models
  - From DISORT
  - Helps with model shape, but absolute magnitude does not agree
- Empirical Models
  - Created by binning footprint data
  - Scene types consistent with new ADMs

592 CERES SW Scenes

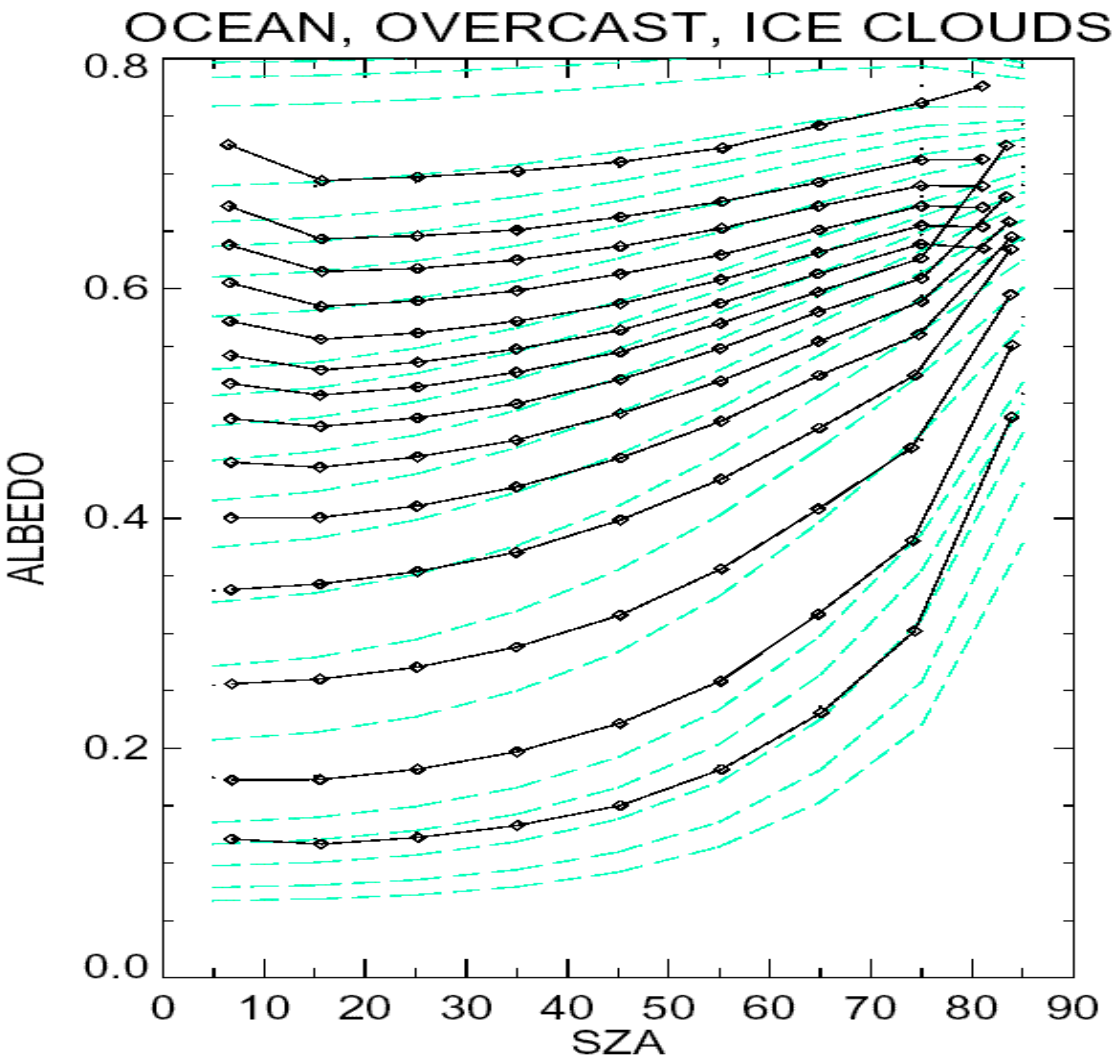
- **Surface** : Ocean, High Tree, Low Tree, Dark Desert, Bright Desert, Snow
- **Percent Cloudy** 6 – 13 bins

  (Clear, 0.1-10%,…95-99.9%, 99.9-100%)
- **Cloud Phase** (liquid < 1.5, ice >1.5)
- **Optical Depth** 6 - 14 bins
  (0.01-1.0, 1.0-2.5, …, 40-50, >50)

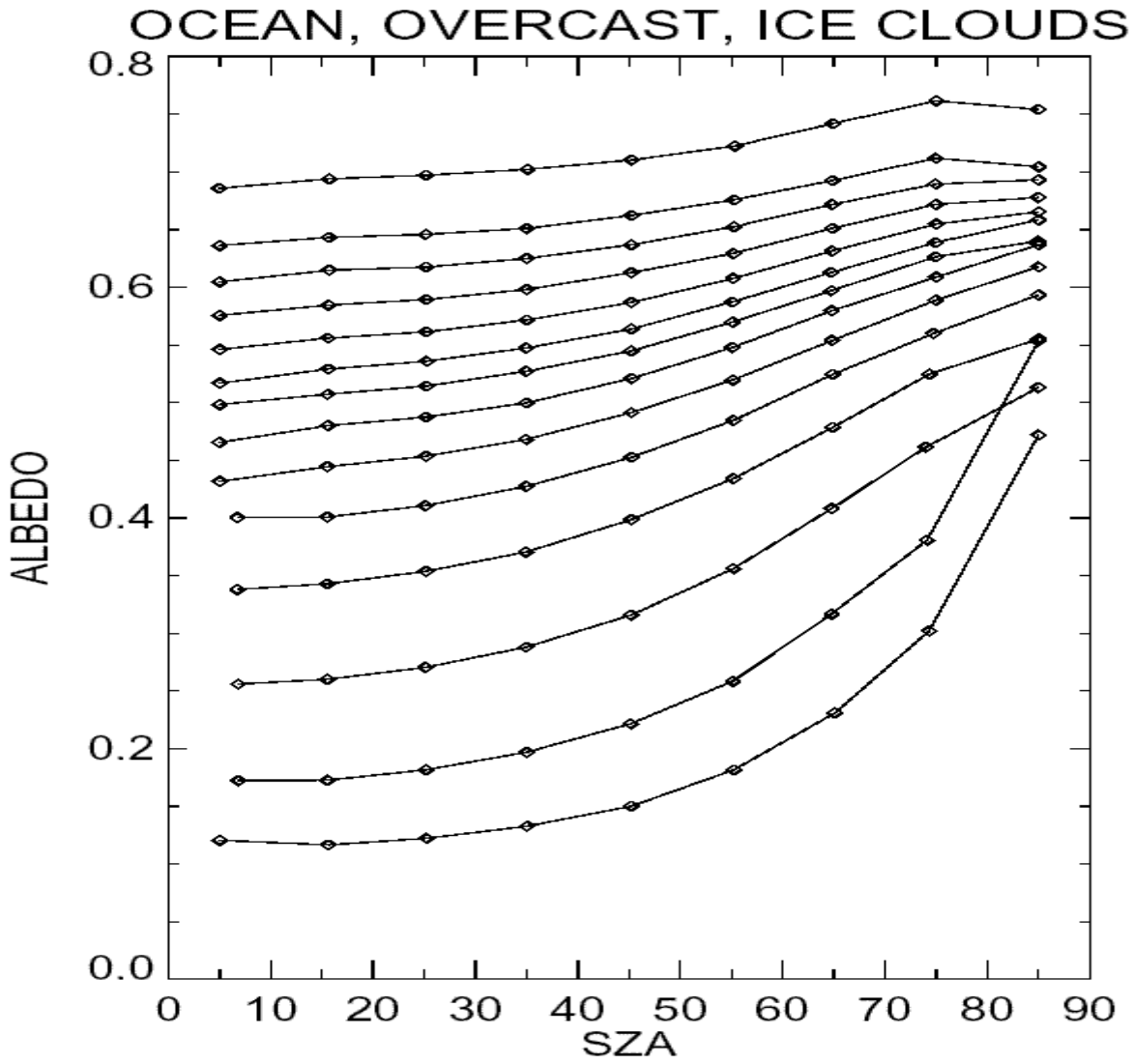
Of the 592 SW DRMs:

- 223 models are well sampled. These models represent 99% of footprints.
- 131 models are partially sampled
  - Use interpolation of theory to fill in missing or bad data
- 237 have virtually no sampling
  - Use average of Overcast and Clear models

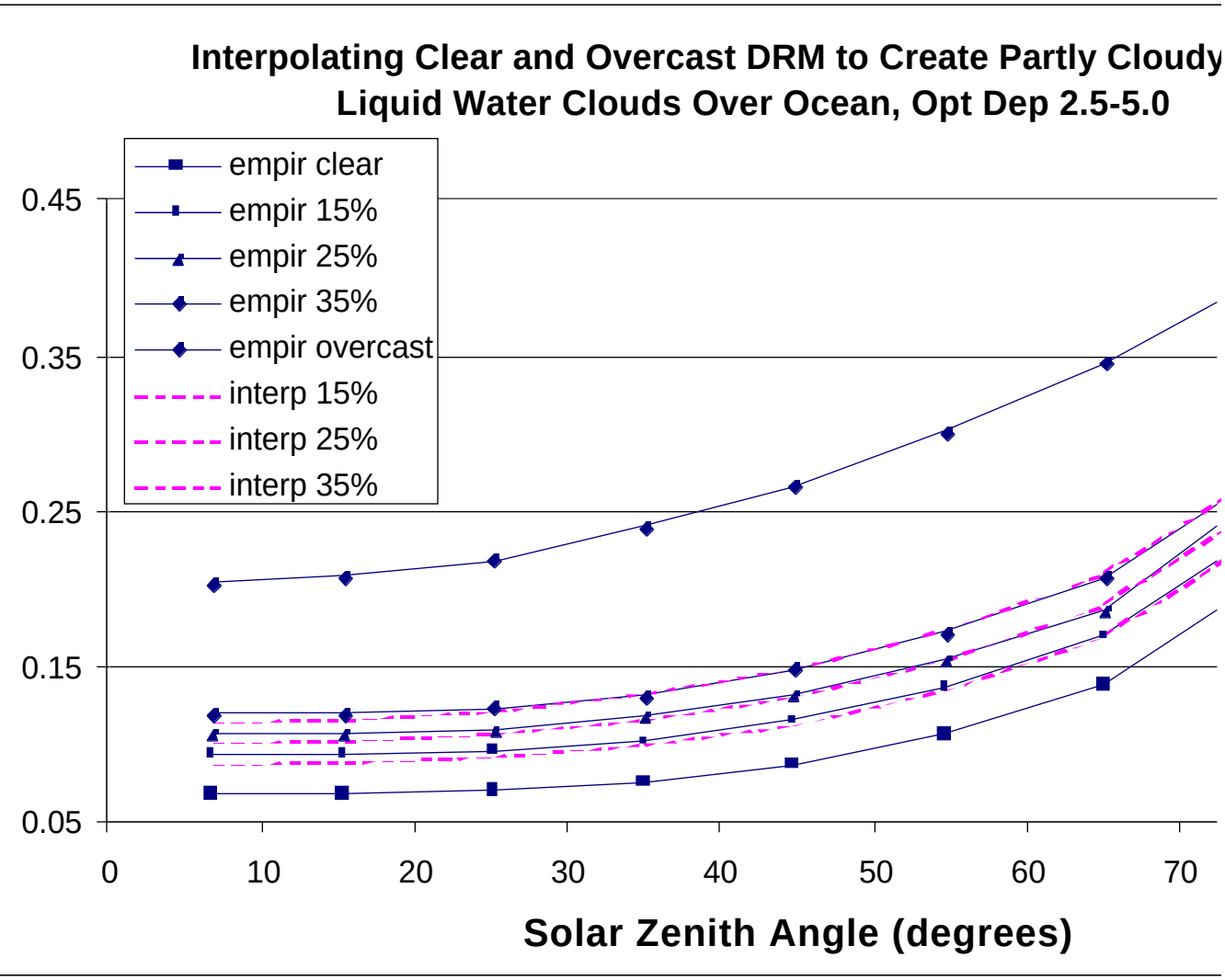
Empirical vs. Theory (dashed lines)



Interpolated 1st and 9th bins



Creating Partly cloudy models



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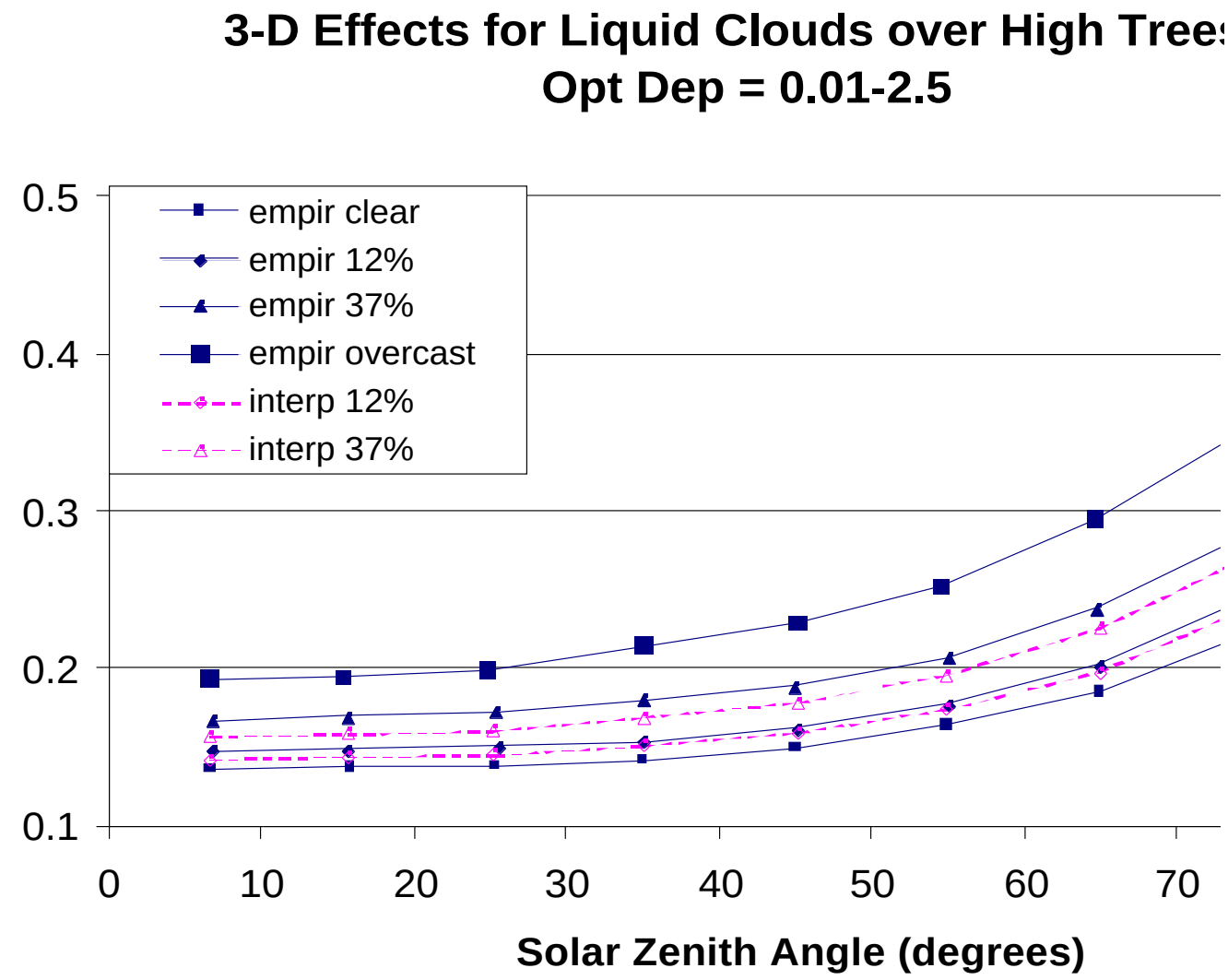
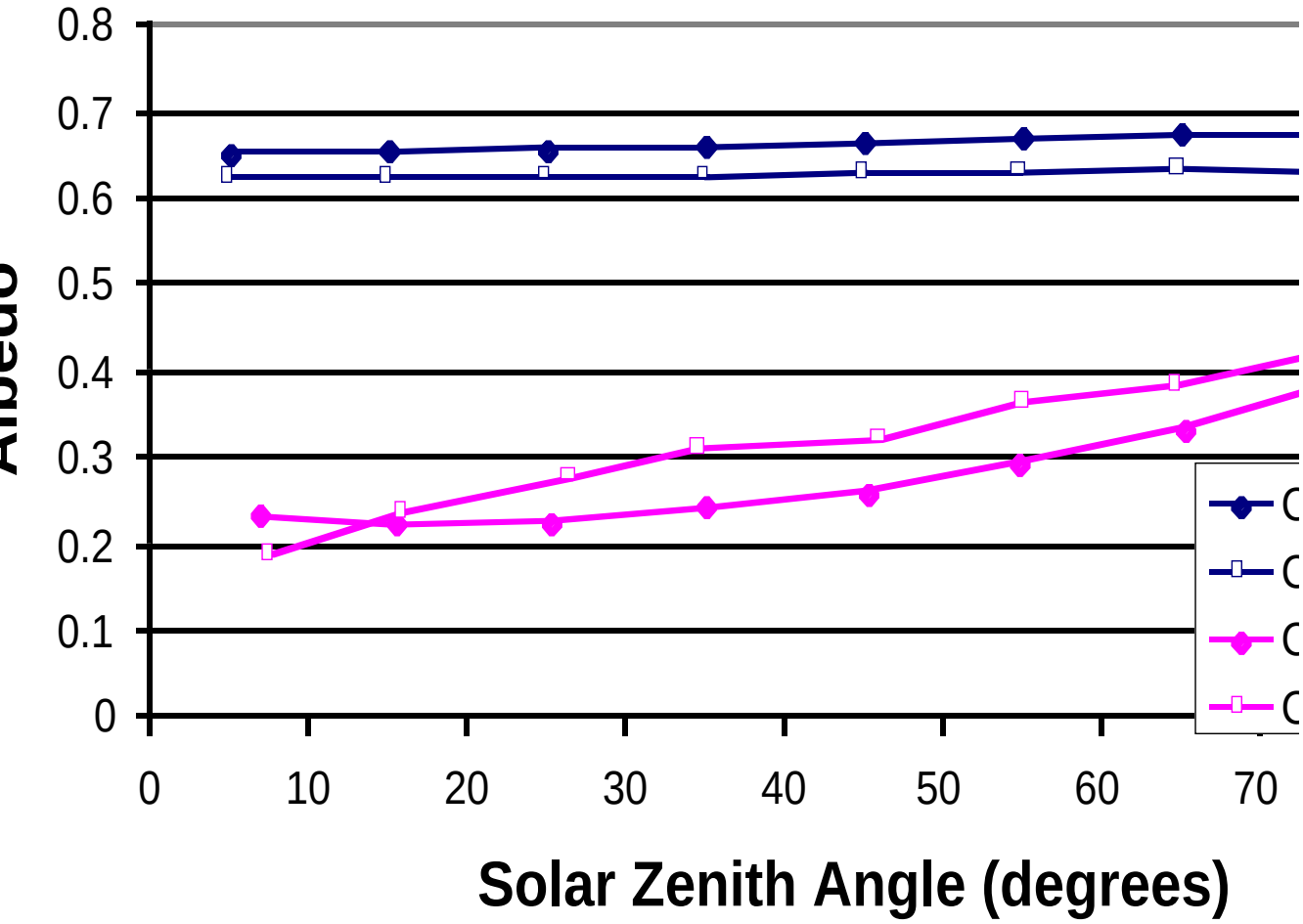


SNOW DIRECTIONAL MODELS



Future Plans

- Identify remaining problems
  - Separate clear and cloudy snow
  - Eliminate increase in albedo at overhead sun
- Finalize models
- Validate using “direct integration”
  - Compare monthly means with raw fluxes averaged over several precessionary cycles