Summary of Papers presented by Hyung-Jin Choi (03-24-2008)

Paper 1: Rudich, Y., O. Khersonky, and D. Rosenfeld, Treating clouds with a grain of salt, Geophys. Res. Lett., 29, doi:10.1029/2002GL016055, 2002.
Paper 2: Rosenfeld, O., Y. Rudich, and R. Lahav, Desert dust suppressing precipitation: A possible desertigication feedback loop, PNAS, 98, 5975-5980, 2001.
Paper 3: Levin, Z., A. Teller, and E. Ganor, On the interactions of mineral dust, sea-salt particles, and cloud” Ameasurement and modeling study from the Mediterranean Lsraeli Dust Experiment campaign, J. Geophys. Res., 110, D20202, doi:10,1029/2005JD005810, 2005.

Comparison of three papers:

	Rudich	Rosenfeld	Levin	
Observation	Satellite image (NOAA-AVHRR)	Satellite/aircraft (AVHRR, TRMM)	Satellite/aircraft (MODIS, TRMM)	
Region	Aral Sea	Eastern Mediterranean	Eastern Mediterranean	
Date	May 1998	March 1998	Jan. & Feb. 2003	
Main focus	Effect of large salt-containing dust particles on cloud drops	Effect of desert dust on cloud properties and precipitation	Effect of mineral dust, sea-salt particles on clouds	
Observation Results				
Dust	Natural salt-containing dust (GCCN)	Small droplets (Desert dust)	Mineral dust particles coated with sea salt	
Cloud drop size	Increase	Reduce	Increase	
precipitation	Enhance on large continental scale	Inhibit	Increase	
MODEL SETUP				
Models	X	X	2D-numerical cloud model	
Domain - Range	300m × 300m			
Analysis Time	26min, 46min			
Campaign	MEIDEX (the Mediterranean Israeli Dust Experiment)			
Scenarios	continental	semicontinental	With GCCN	With dust as IN
Aerosol Distribution (particles cm^{-3})	1. fine: 900	1. fine: 300	15	10
Aerosol Type	Con.	Maritime	Both	Both
GCCN	Sulfate			
Meteorological Condition	Winter convective clouds without wind shear in the eastern Mediterranean region			
CLOUD PROPERTIES CHANGES WITH INCREASING AERSOSOL CONCENTRATION				
Cloud Fraction	Con. > Semi			
Cloud life time	Con. > Semi			
Cloud Top Height	Con. > Semi		Reduce in con. but has little effect on mari.(semi)	
Cloud Droplet radius			Enhance in con. Clouds	
Precipitation Rate	Con. < Semi		Increase 37% compared to without GCCN in con.	Reduce
Precipitation Area	Con. < Semi		Increase 9%	

Important Overall Conclusions:

1. Most small size aerosols types, such as biomass burning, urban and industrial air pollution, and desert dust,
   A. Reduce the size of cloud droplets
   B. Increase cloud albedo
   C. Suppress precipitation
   => Drizzle production decreases with increasing cloud condensation nuclei (CCN) concentration

2. Large soluble aerosols
   A. Increase droplets growth
   B. Promote precipitation formation
   => The relative impact of giant CCN (GCCN) increases with increasing CCN concentration. Therefore, the addition of giant and ultra giant CCN to the continental atmosphere can enhance precipitation-formation processes.

3. Enhanced CCN could lead
   A. To increase in latent heat release
   B. To its distribution over a larger vertical extend of the cloud,
   C. And leading to taller clouds.

4. By using 2-D model,
   A. The rain amounts in the continental clouds increased by as much as 37% compared to those without the coarse-mode CCN.
   B. If the properties of dust particles as efficient IN are also included, Rrecipiration rate decreases.
   C. The more maritime clouds do not produce any significant changes in the cloud development and in the rain amount on the ground.
   D. GCCN with enhanced IN affect the horizontal dimensions of the continental clouds by increasing it, and reduce the height. But on the maritime clouds has little effect.

Summary of Papers presented by Anton Darmenov (03-31-2008)

Paper 1: Cook et al., Dust and sea surface temperature forcing of the 1930's 'Dust Bowl' drought. Geohp. Res. Letters, subm., 2008.

Paper 2: Yoshioka et al., Impact of Desert Dust Radiative Forcing on Sahel Precipitation: Relative Importance of Dust Compared to Sea Surface Temperature Variations, Vegetation Changes, and Greenhouse Gas Warming. Journal of Climate, 20, 1445-1467, 2007.

Recommended reading: Miller, R., I. Tegen, and J. Perlwitz, 2004: Surface radiative forcing by soil dust aerosols and the hydrologic cycle. J. Geophys. Res., 109, D04203, doi:10.1029/2003JD004085.

Comparison of three papers:

	Cook et al.	Yoshioka et al.
Observation	GHCN precipitation data set	Precipitation data set
Region	North America	African Sahel
Time period	1930's	1980s
Main focus	Effect of dust radiative forcing and SST on precipitation during the 'Dust Bowl'	Investigate possible effect of direct radiative forcing of dust on Sahel precipitation trough its impacts on the atmosphere and the surface
Observation Results		
Dust	NA	NA
Cloud drop size	NA	NA
precipitation	decrease	decrease
MODEL SETUP		
Models	GISS Model E	CCCSM3 & CLM3 + CAM3
Domain	global	global
Analysis Time	1920-1929 1932-1939	1950-1960 1981-1990
Campaign	NA	NA
Meteorological Condition	observed severe drought during 1930s	observed severe drought during 1980-1990
TAO and SFC forcing changes with increasing dust concentration		
Regional –TOA SW/LW/Net	NA	-2.50/+0.00/-2.50 [W m-2]
Global –TOA SW/LW/Net	NA	-0.92/+0.32/-0.60 [W m-2]
Regional –ATM SW/LW/Net	NA	+2.50/-0.00/-0.00 [W m-2]
Global –ATM SW/LW/Net	NA	+0.67/-0.81/-0.14 [W m-2]
Regional –SFC SW/LW/Net	NA	-2.50/+0.00/-2.50 [W m-2]
Global –SFC SW/LW/Net	NA	-1.59/+1.13/-0.46 [W m-2]
Cloud properties changes with increasing dust concentration		
Cloud Properties	NA	NA
Precipitation	decrease	decrease

Overall Conclusions:

1. SST forced with dust tends to produce better agreement with preciptation observations

2. Radiative forcing of dust acts to reduce the global average precipitation.
    A. Direct radiative forcing of dust has played a role in the observed droughts in the Sahel
    B. Regionally dust reduces the precipitation, thus creating mechanism for feedback – drought in Sahel increased dust and cases further precipitation reduction