PECAN

Plains Elevated Convection At Night

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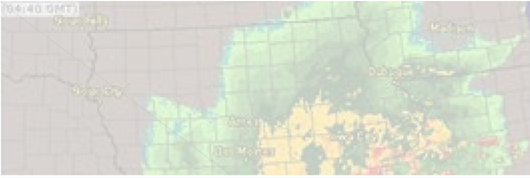
Additional Steering Committee members	*Belay Demoz, Howard U.* *John Hanesiak, U. Manitoba* *Kevin Knupp, U. Alabama* *Matthew Parker, N. Carolina State U.* *Russ Schumacher, CSU* *Josh Wurman, CSWR*
One-page statements of interest	*28 total from 21 organizations;* *4 are international* *59 PIs & co-PIs* *up to 17 proposals to NSF*

Field phase	1 June –15 July 2015
Funding agencies	NSF AGS; NOAA; NASA; DOE
Participating universities	17
Education & outreach	30+ students in the field

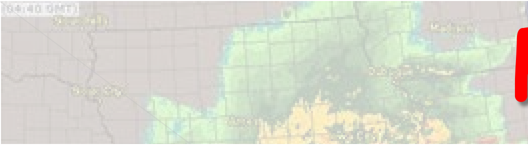
MC3E Breakout Session
ASR Science Team Meeting
18-21 March 2013



PECAN science

Key Topic	Key Hypothesis
Initiation and early evolution of elevated convection (e.g., Wilson and Roberts 2006)	Nocturnal convection is more likely to be initiated and sustained when it occurs in a region of mesoscale convergence above the SBL
Internal structure, microphysics, and dynamics of nocturnal MCSs (e.g., French and Parker 2010)	The microphysical and dynamical processes in developing and mature stratiform regions of nocturnal MCSs are critical to their maintenance and upscale growth through determining the structure and intensity of cold pools, bores and solitary waves that interact with the SBL
Vertical displacements by undular bores and wave-like features (e.g., Koch and Clark 1999)	Bores and associated wave/solitary disturbances generated by convection play a significant role in elevated, nocturnal MCSs through lifting parcels above the SBL to levels at or near their level of free convection
Storm-scale numerical weather prediction (e.g., Surcel et al. 2010)	A mesoscale network of surface, boundary-layer and upper-level measurements will enable advanced data assimilation systems to significantly improve the prediction of convection initiation. Advances in QPF associated with nocturnal convection will require either greatly improved convective parameterizations, or, more likely, horizontal and vertical resolutions sufficient to capture both SBL disturbances and convection

PECAN platforms



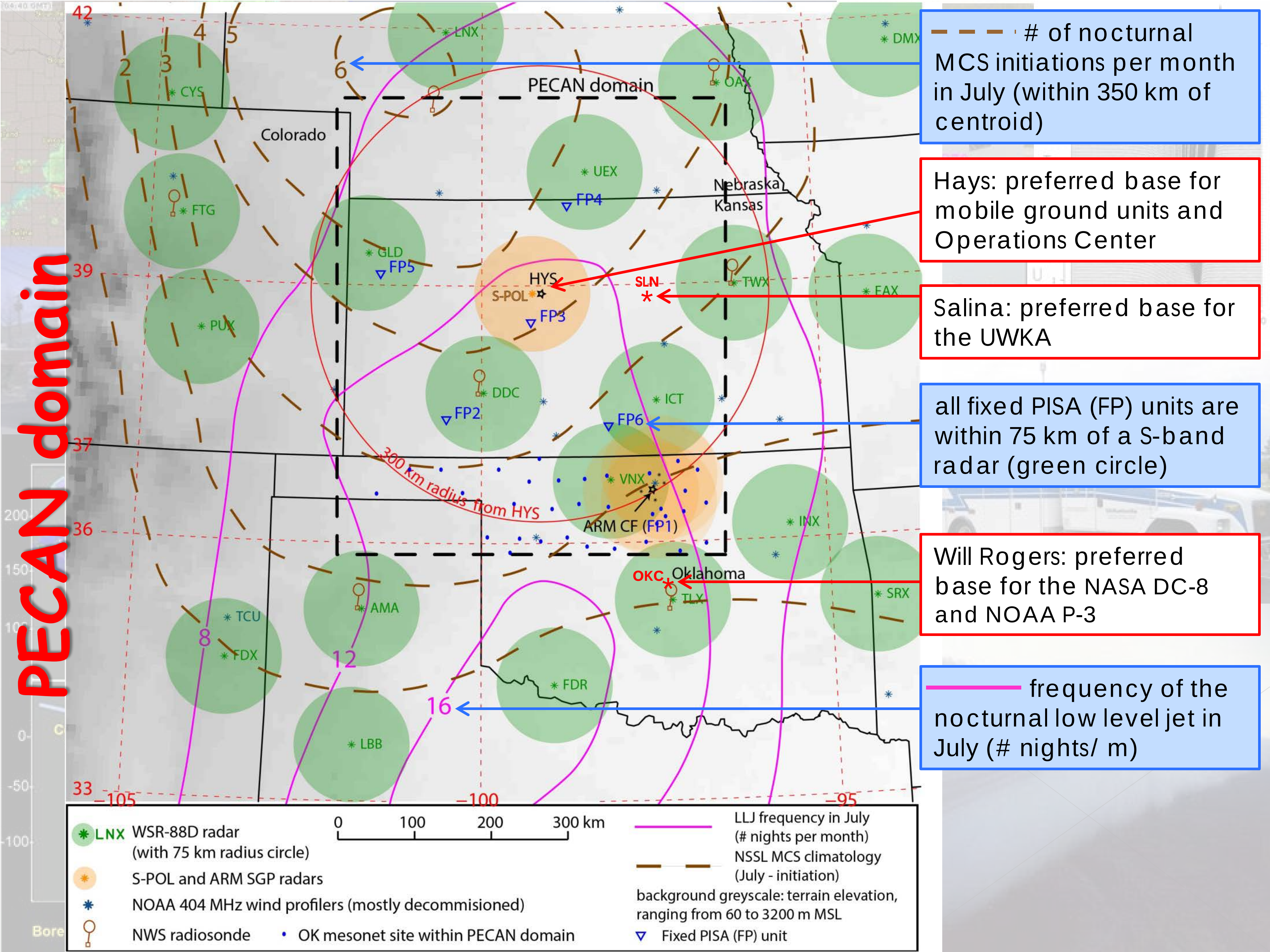
- **scanning radars:**
  - **fixed**: S-PolKa, plus WSR-88D and ARM SGP radars
  - **mobile**: 6 X-band + 2 C-band radars
- **aircraft:**
  - **clear-air**:
    - UW King Air with lidars
    - NASA DC-8 with LASE, interferometer
  - **storm-penetrating**:
    - NOAA P-3 with X-band fore/aft scanning tail radar
    - A-10 may be requested separ-ately to participate in PECAN
- **surface met & sounding vehicles**

- **PECAN Integrated Sounding Array (PISA)**
  - **concept**: a PISA unit ***profiles the kinematic, thermodynamic, and moisture structure of the lower troposphere***.
  - **components**: each unit has
    - surface meteorology
    - a radiosonde
    - wind profiler (radar/sodar/lidar)
    - moisture and/or temperature profiler (DIAL, Raman lidar, microwave radiometer, AERI ...)
  - **array**:
    - 10 complete units enabled by 15 participating institutions
    - 6 fixed PISA units
    - 4 mobile PISA units

- Key challenge: deployment of mobile facilities at night ahead of the target.
- Solutions:
  - Inter-IOP radar & PISA mobility only (not intra-IOP relocations);
  - Advance selection & characterization of potential sites;
  - NSSL forecast & nowcast guidance.

PISA building blocks

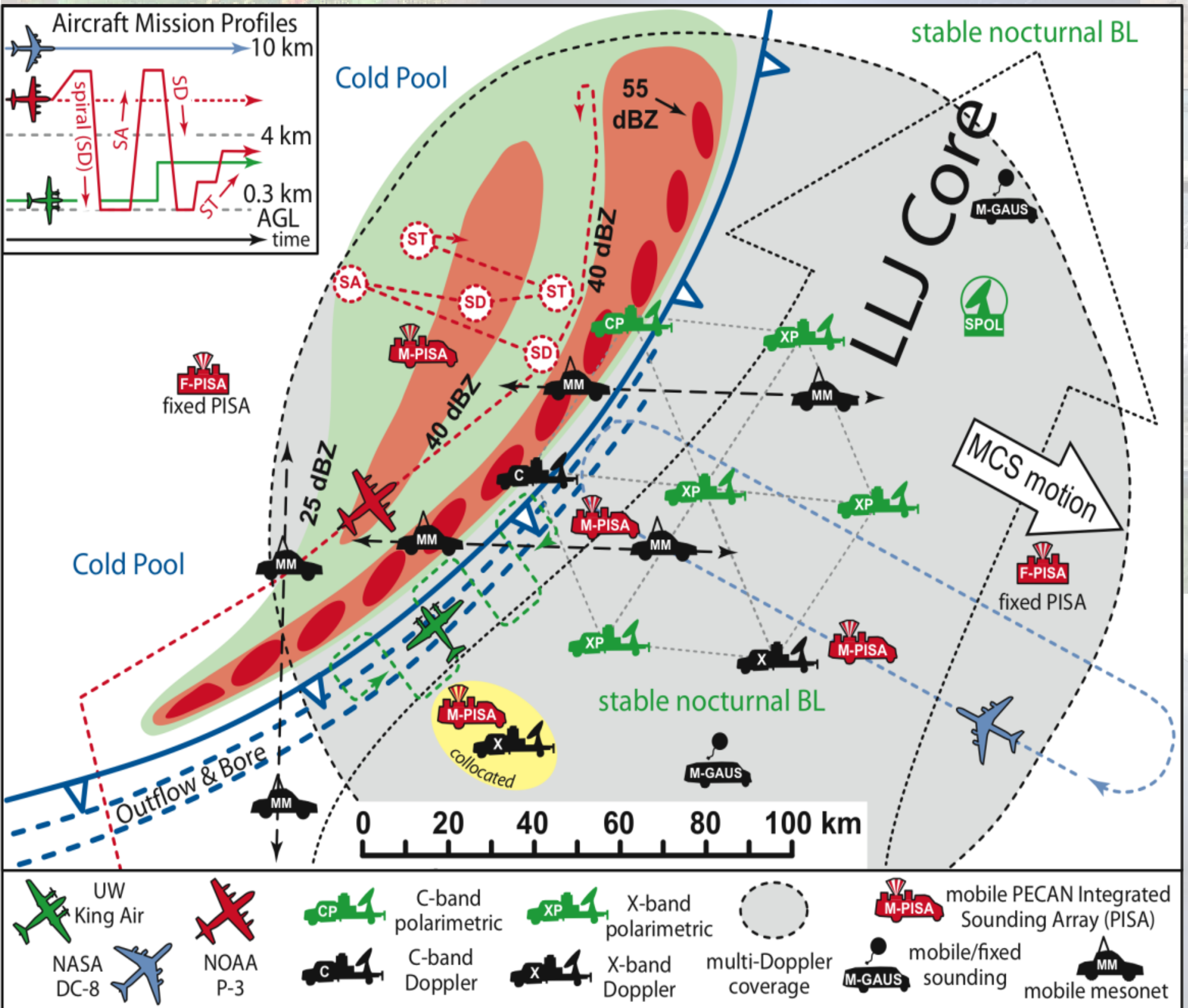
ID	lead PI	instrument source	instruments
fixed profiling units (FP): stationary during the duration of PECAN, operating continuously			
FP1	David Turner	ARM CART Central Facility	wind lidar, Raman lidar, AERI, MR, sfc met and sfc fluxes, radiosonde unit, four 915 MHz WPs with a typical spacing of 10 km
FP2	Rich Clark + Belay Demoz	Millersville University	1000 m tethersonde profiles of met variables/turbulence, sfc met and sfc fluxes, backscatter lidar, radiosonde unit, and sodar
		Howard Univ. and NASA/GSFC	ALVICE Raman lidar & GLOW and/or Leosphere wind lidars, MR
FP3	David Parsons + Volker Wulfmeyer	NCAR EOL	ISS-449, mini DIAL
		University of Hohenheim, Germany	scanning DIAL (water vapor) and scanning rotational Raman lidar (temperature)
		Colorado State University	radiosonde unit
		University of Manitoba	MR and wind lidar
FP4	Tammy Weckwerth	NCAR EOL	ISS with 915 MHz WP, mini DIAL, GAUS, sfc met
		Radiometrics	MR
		Naval Postgrad School	flux tower, sodar, tethersonde
FP5	Tammy Weckwerth	NCAR EOL	ISS with 915 MHz WP, sodar, mini DIAL, GAUS, sfc met
		Radiometrics	MR
FP6	John Hanesiak	University of Manitoba	MR, wind lidar, AERI
		DOE	radiosonde unit & sfc met (ARM SPG Larned site)
mobile profiling units (MP): operate during IOPs only			
MP1	David Turner	University of Oklahoma, NSSL	CLAMPS: AERI, MR, and scanning Doppler lidar
		University of Oklahoma	radiosonde & sfc met
MP2	Kevin Knupp	University of Alabama Huntsville MIPS truck	scanning Doppler lidar, 915 MHz WP, MR, sodar, ceilometer, sfc met, radiosonde unit
MP3	David Parsons, H. Bluestein, Wayne Feltz	Naval Postgraduate School	TWOLF Doppler lidar & FM-CW radar (both truck-mounted) + sfc met
		University of Wisconsin	AERI + multi-spectral aerosol lidar + radiosonde unit
MP4	T. Weckwerth	NCAR EOL	Mobile ISS with 915 MHz WP, MGAUS, sfc met


PECAN domain
# of nocturnal MCS initiations per month in July (within 350 km of centroid)
Hays: preferred base for mobile ground units and Operations Center
Salina: preferred base for the UWKA
all fixed PISA (FP) units are within 75 km of a S-band radar (green circle)
Will Rogers: preferred base for the NASA DC-8 and NOAA P-3
frequency of the nocturnal low level jet in July (# nights/ m)
PECAN domain
Colorado
Nebraska
Kansas
Oklahoma
LNX
CYS
FTG
PUX
GLD
UEX
OAX
DMX
TWX
EAX
DDC
ICT
VNX
INX
SRX
TLX
AMA
TCU
FDX
FDR
LBB
HYS
S-POL
SLN
OKC
FP1
FP2
FP3
FP4
FP5
FP6
ARM CF (FP1)
300 km radius from HYS
42
39
37
36
33
−105
−100
−95
1
2
3
4
5
6
8
12
16
WSR-88D radar (with 75 km radius circle)
S-POL and ARM SGP radars
NOAA 404 MHz wind profilers (mostly decommissioned)
NWS radiosonde
OK mesonet site within PECAN domain
0
100
200
300 km
LLJ frequency in July (# nights per month)
NSSL MCS climatology (July - initiation)
background greyscale: terrain elevation, ranging from 60 to 3200 m MSL
Fixed PISA (FP) unit

PECAN deployment strategy

example: MCS mission

mission type	target # IOPs
convection initiation	5
MCS dynamics &microphysics	10
bores	5



Mobile platforms are deployed ahead of target MCS.

Mobile radars and PISA units remain fixed during IOPs not just for safety, but also to sample both the storm and the broader environment (LLJ, BL evolution).

Aircraft move with the MCS.