

WELCOME to the Cosmic Ray Anisotropy Workshop 2011

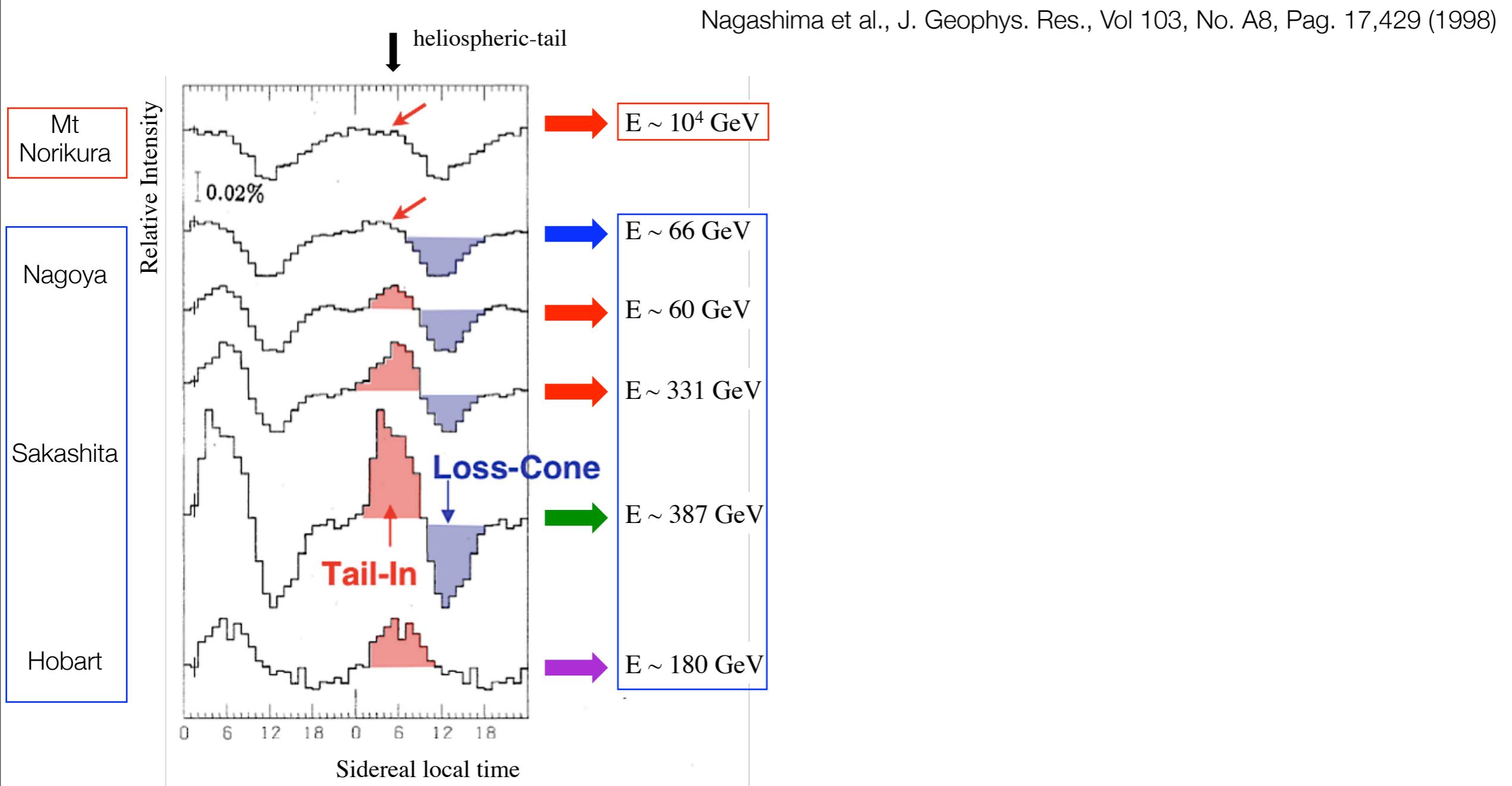
The Local Organizing Committee

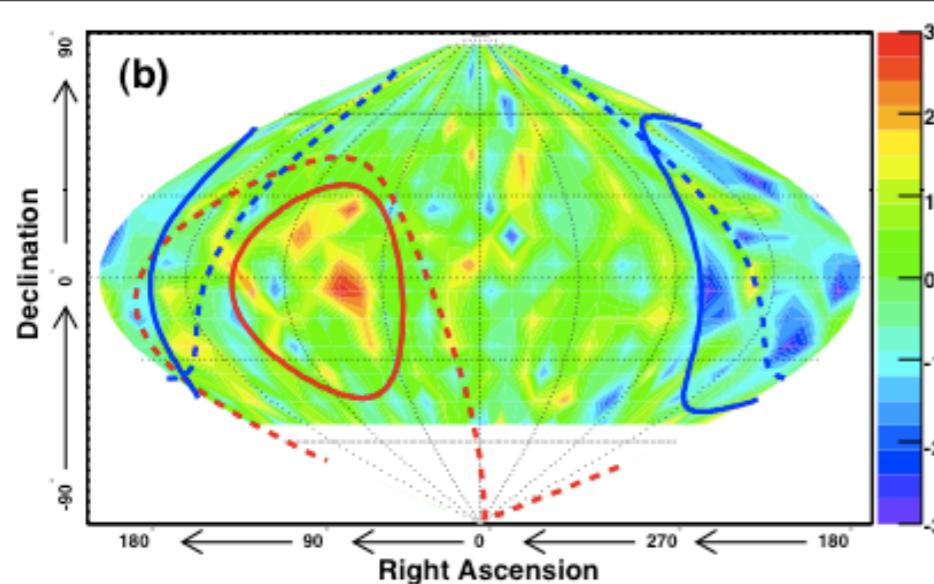
BenZvi, Segev
Desiati, Paolo
Santander, Marcos
Toscano, Simona
Westerhoff, Stefan
Dr. Abbasi, Rasha

<http://events.icecube.wisc.edu/cosmic2011>

Pyle Center, Madison, WI

low energy cosmic ray anisotropy in arrival direction

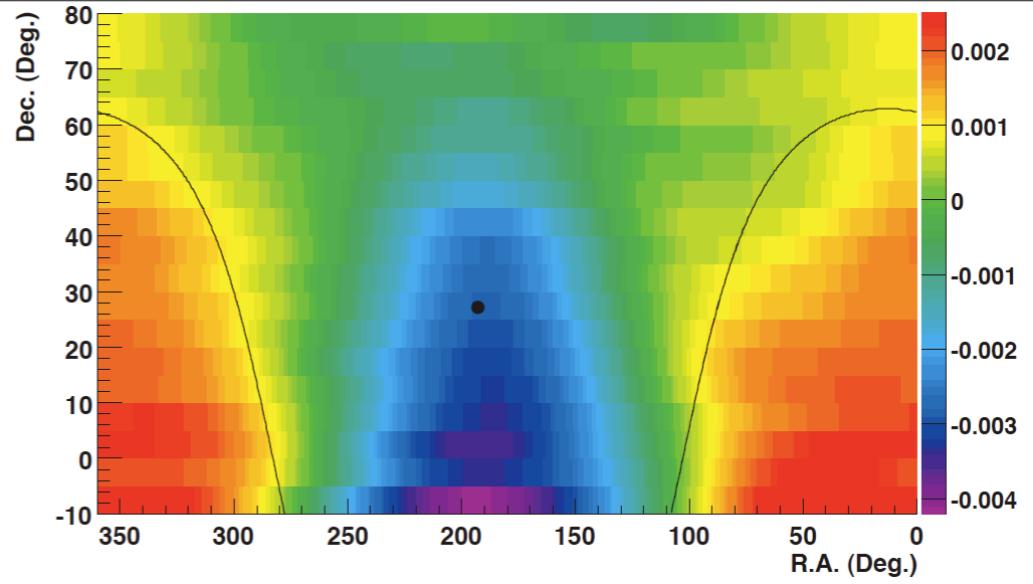




Super-Kamiokande

Guillian et al., Phys Rev D, Vol 75, 063002 (2007)

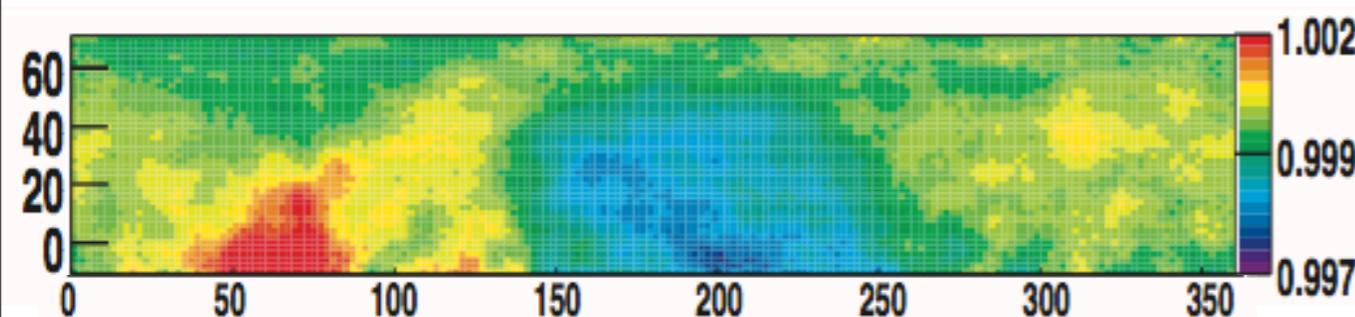
- ▶ $2.1 \cdot 10^8$ events
- ▶ angular resolution $< 2^\circ$
- ▶ median CR energy ~ 10 TeV



Milagro

Abdo et al., ApJ, Vol 698-2, pag 2121 (2009)

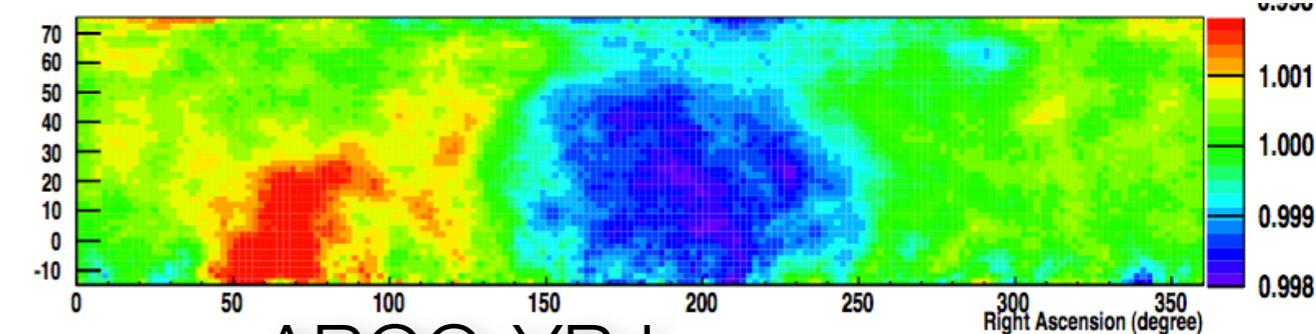
- ▶ $9.5 \cdot 10^{10}$ events
- ▶ angular resolution $< 1^\circ$
- ▶ median CR energy ~ 6 TeV



Tibet-III

Amenomori et al., Science Vol. 314, pp. 439, 2006

- ▶ $3.7 \cdot 10^{10}$ events
- ▶ angular resolution $\sim 0.9^\circ$
- ▶ modal CR energy ~ 3 TeV



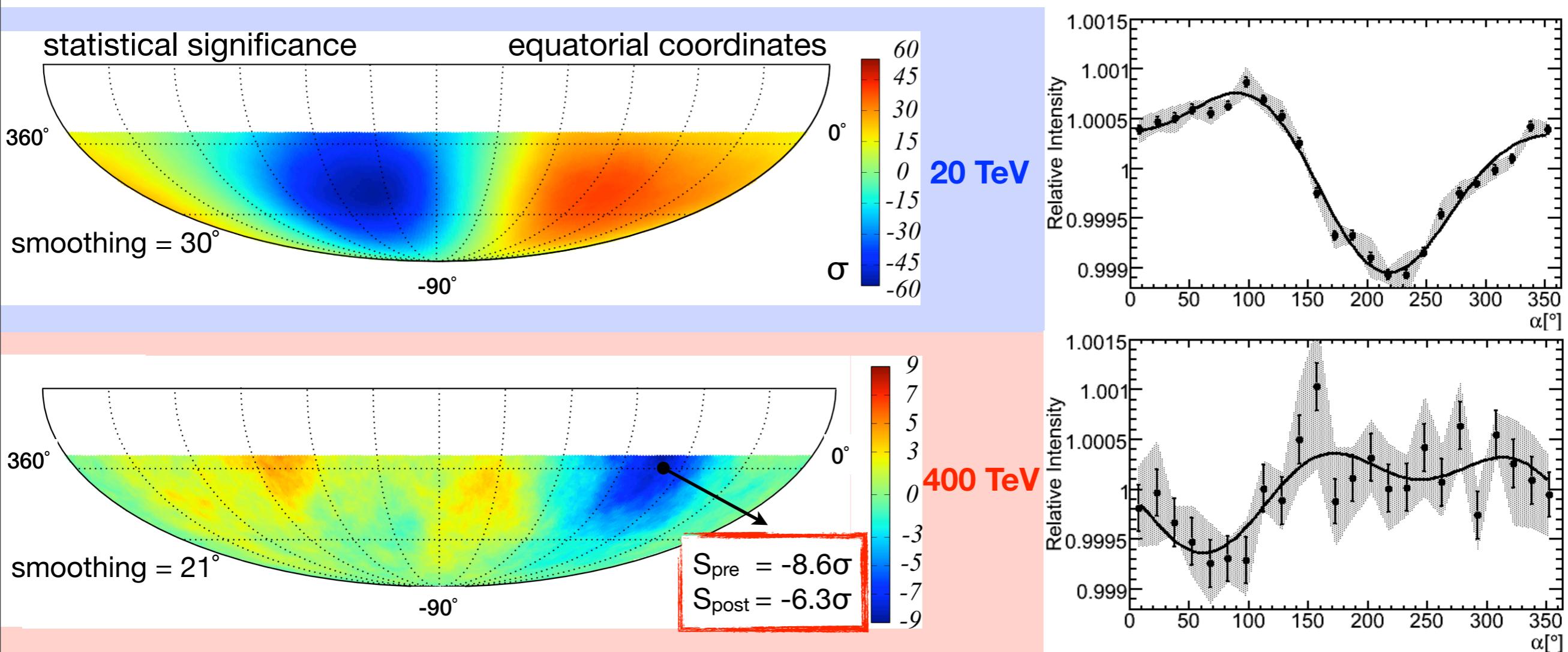
ARGO-YBJ

J.L. Zhang et al., 31st ICRC Łódź - Poland, 2009

- ▶ 365 days livetime
- ▶ $6.5 \cdot 10^{10}$ events
- ▶ median CR energy ~ 1.1 TeV

cosmic ray anisotropy

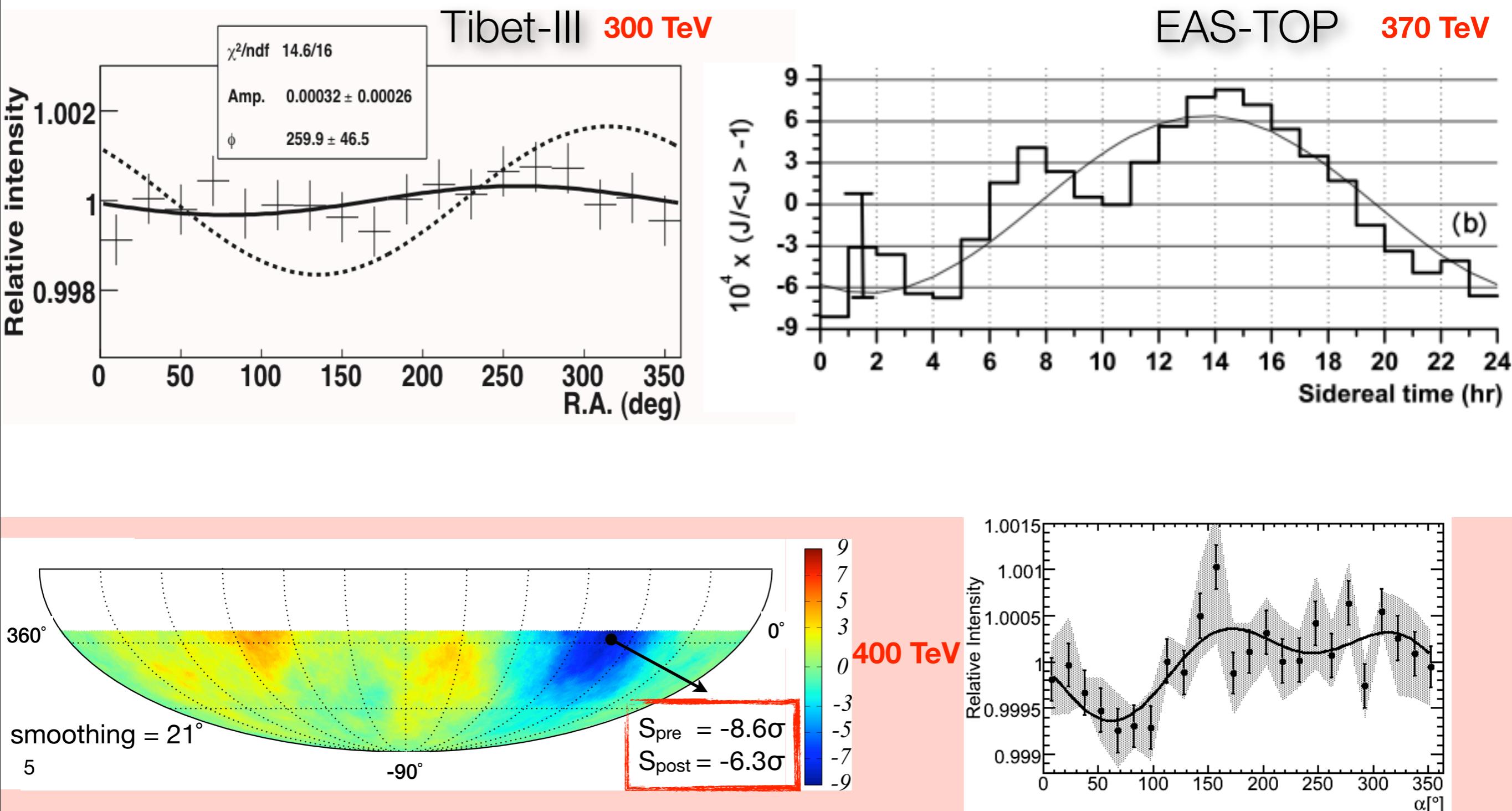
arXiv:1109.1017



$$n=2 \sum_{j=1} A_j \cos[i(\alpha - \phi_j)] + B$$

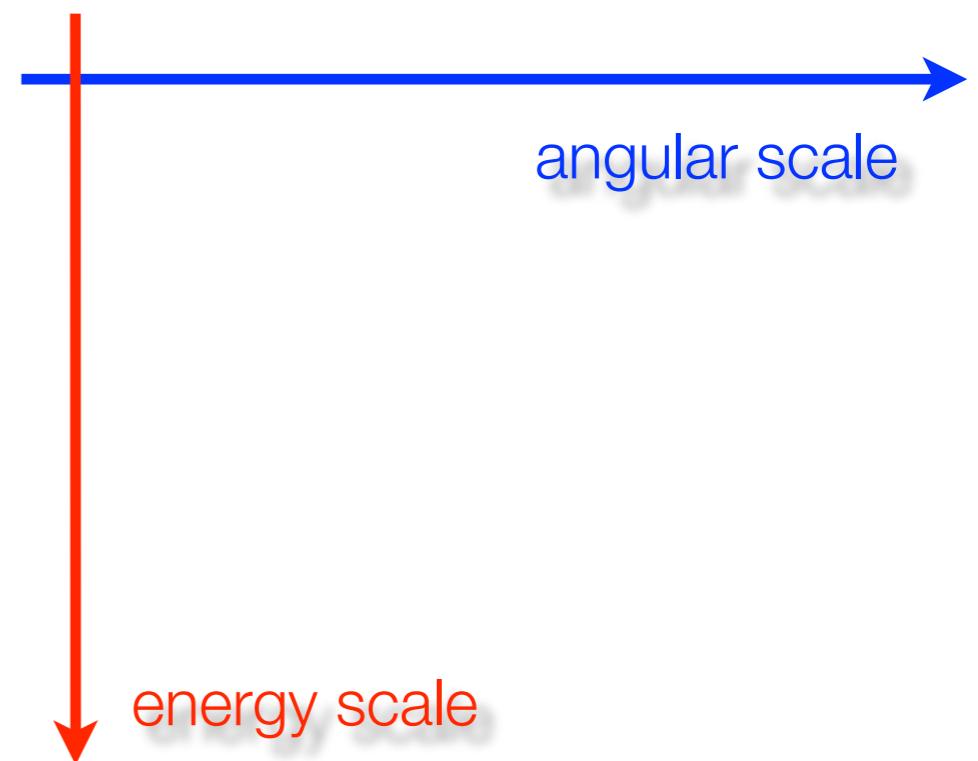
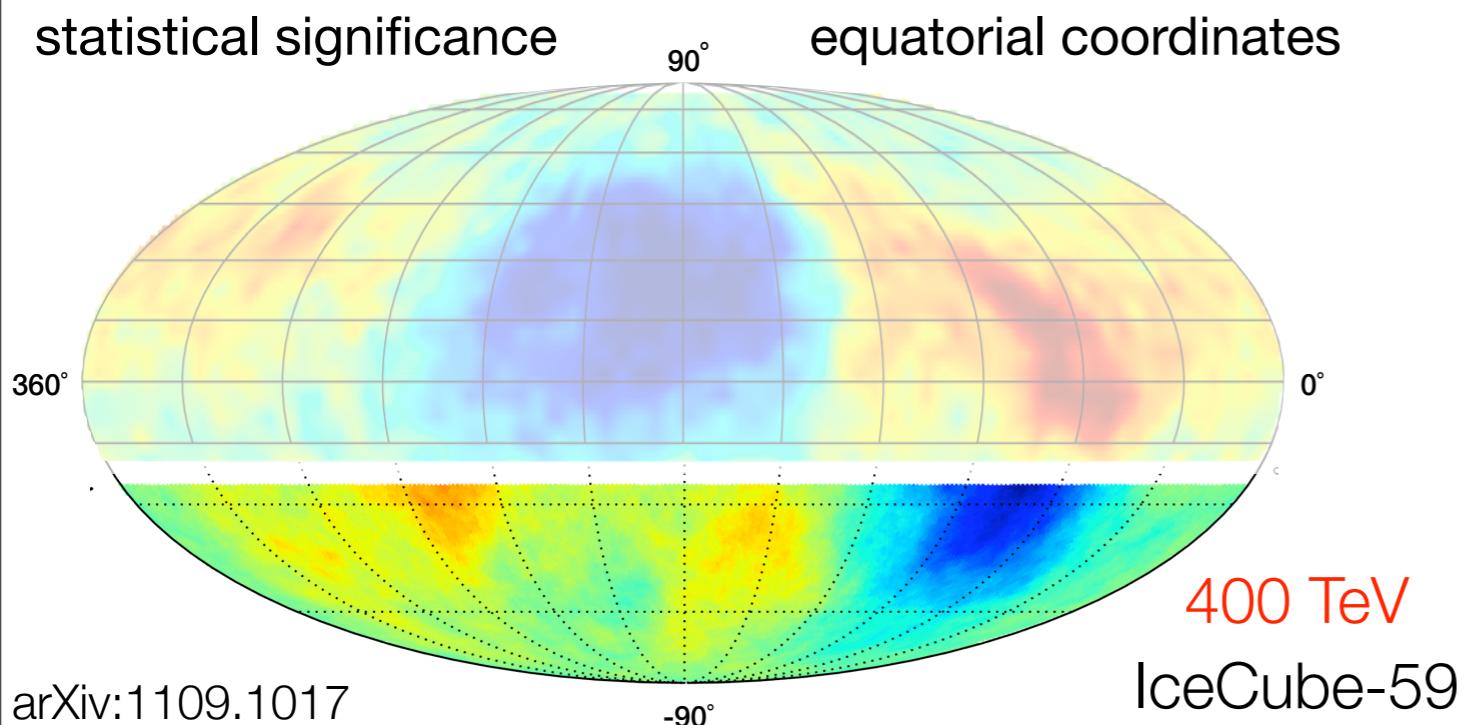
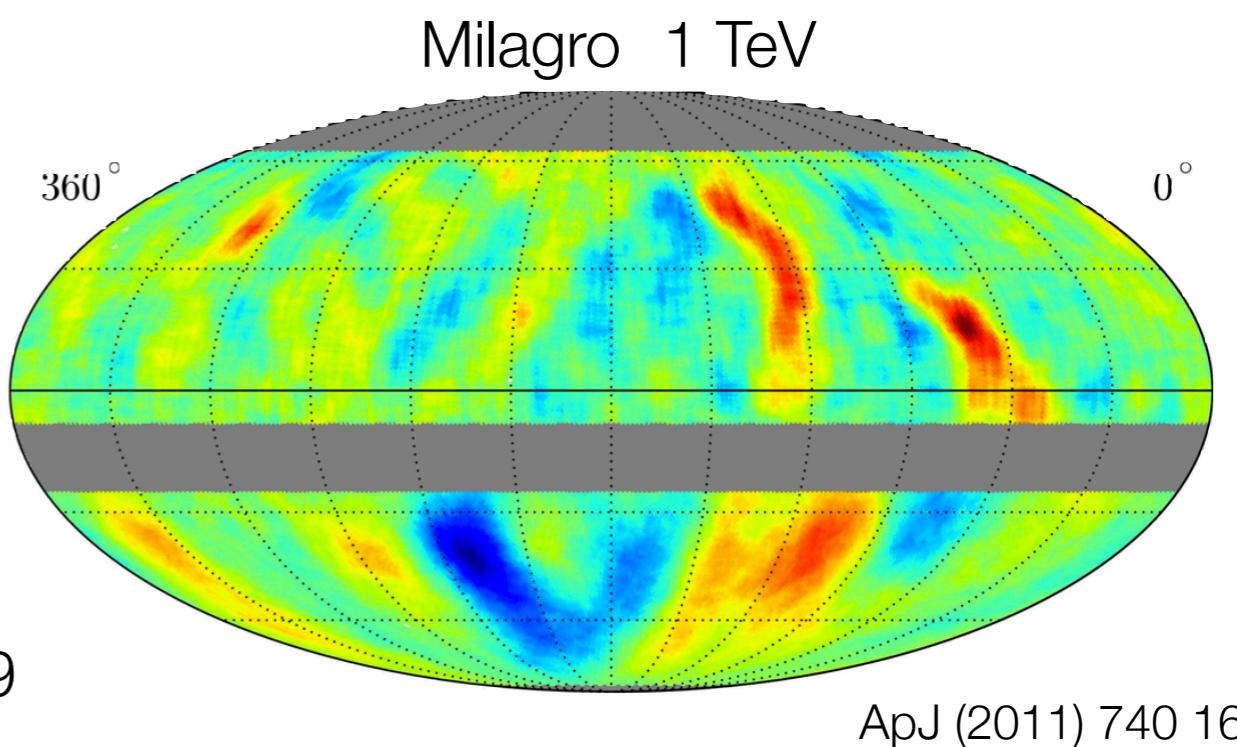
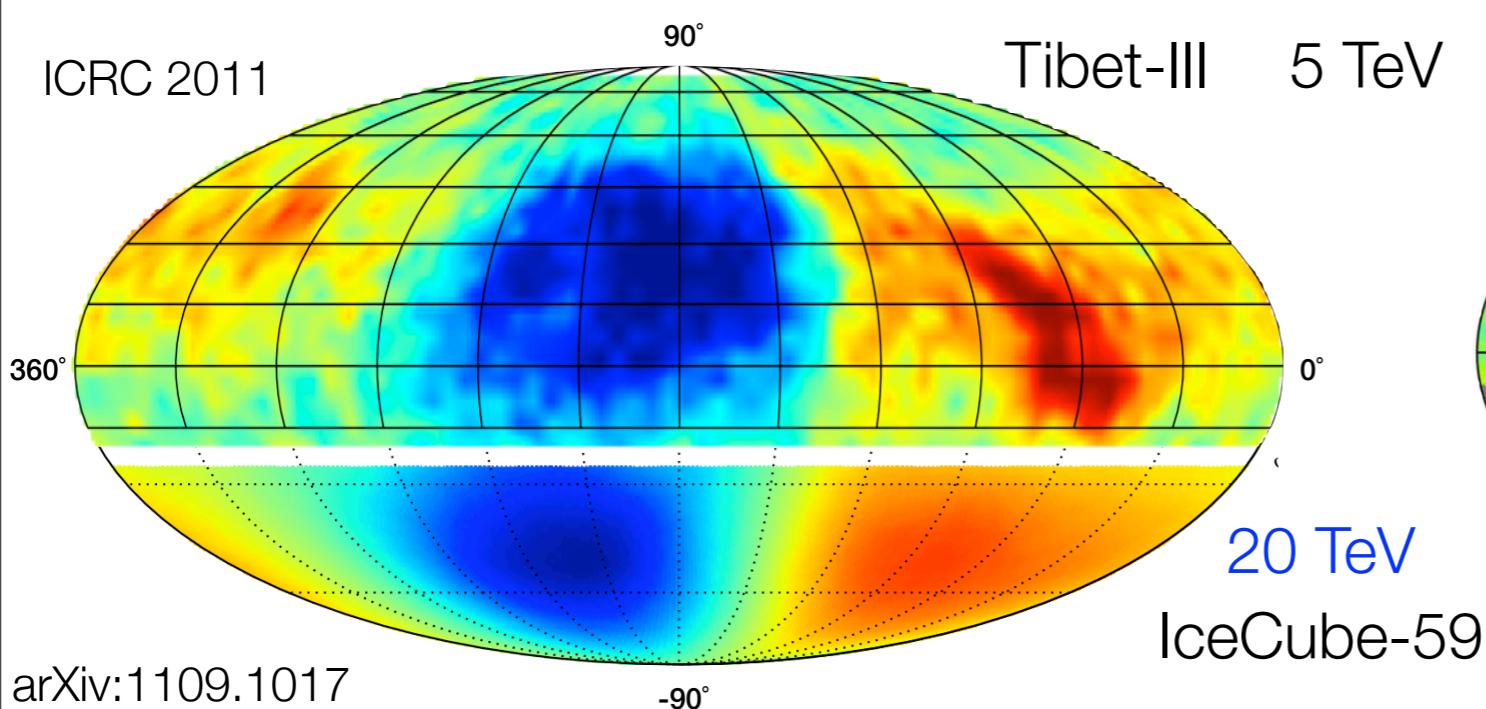
	E_{primary} (TeV)	events (10^9)	A_1 (10^{-4})	ϕ_1 ($^\circ$)	A_2 (10^{-4})	ϕ_2 ($^\circ$)	χ^2/ndf
sidereal	20	17.9	$7.9 \pm 0.1 \pm 0.4$	$50^\circ.5 \pm 1^\circ.0 \pm 1^\circ.1$	$2.9 \pm 0.1 \pm 0.4$	$299^\circ.5 \pm 1^\circ.3 \pm 1^\circ.5$	95/19
	400	0.5	$3.7 \pm 0.7 \pm 0.7$	$239^\circ.2 \pm 10^\circ.6 \pm 10^\circ.8$	$2.7 \pm 0.7 \pm 0.6$	$152^\circ.7 \pm 7^\circ.0 \pm 4^\circ.2$	34.19

cosmic ray anisotropy



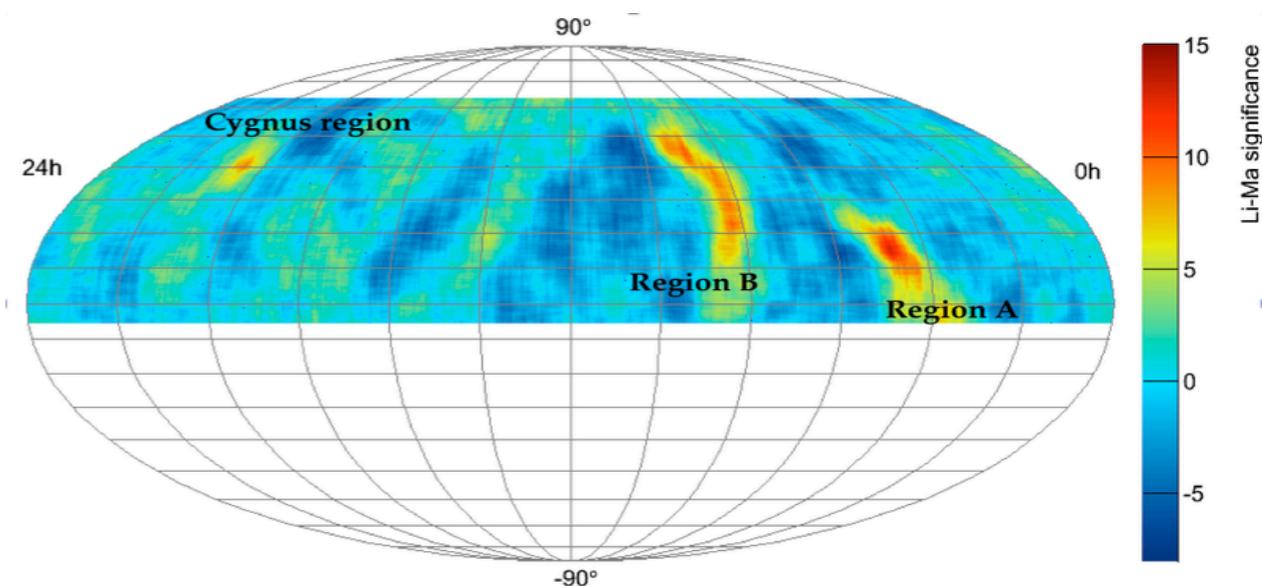
cosmic ray anisotropy

PRL (2008) 101 221101

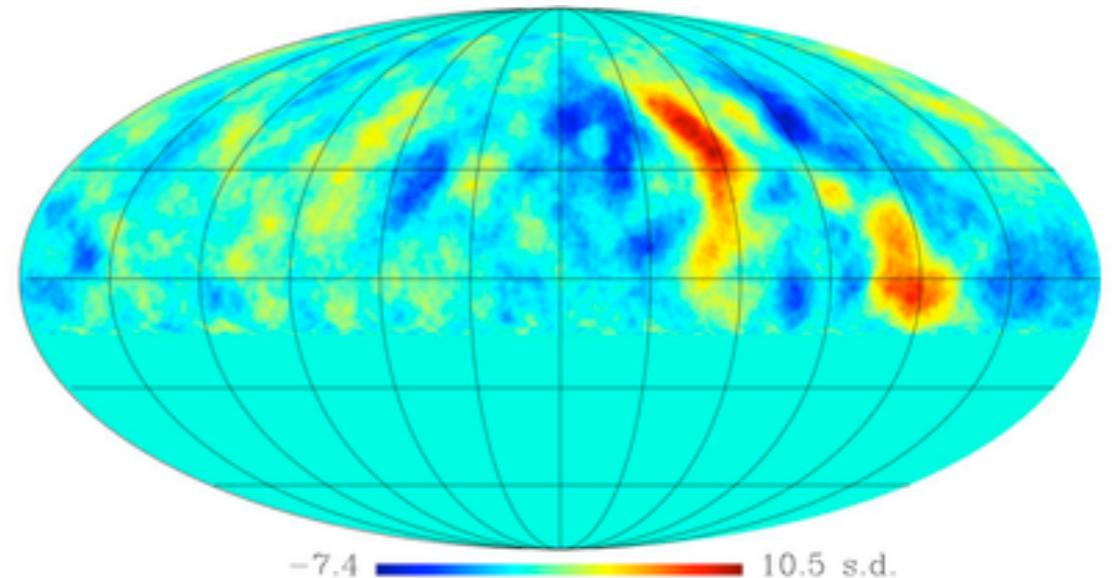


medium / small scale anisotropy for different experiments

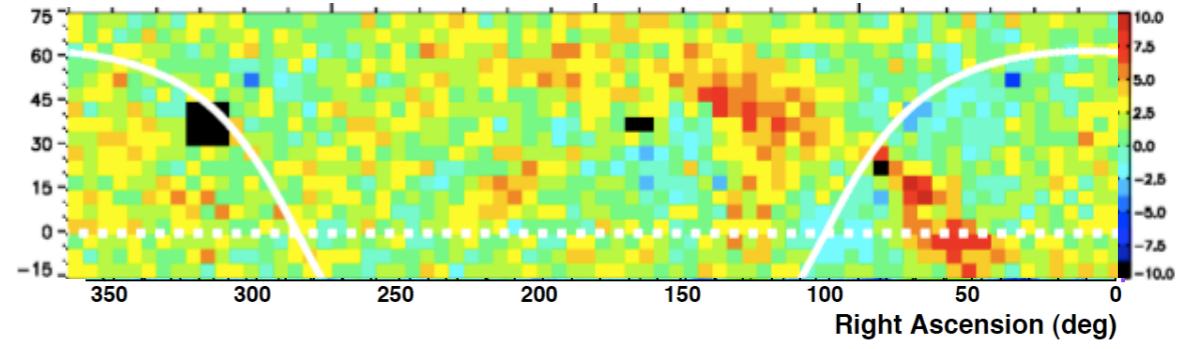
Milagro
(direct integration)



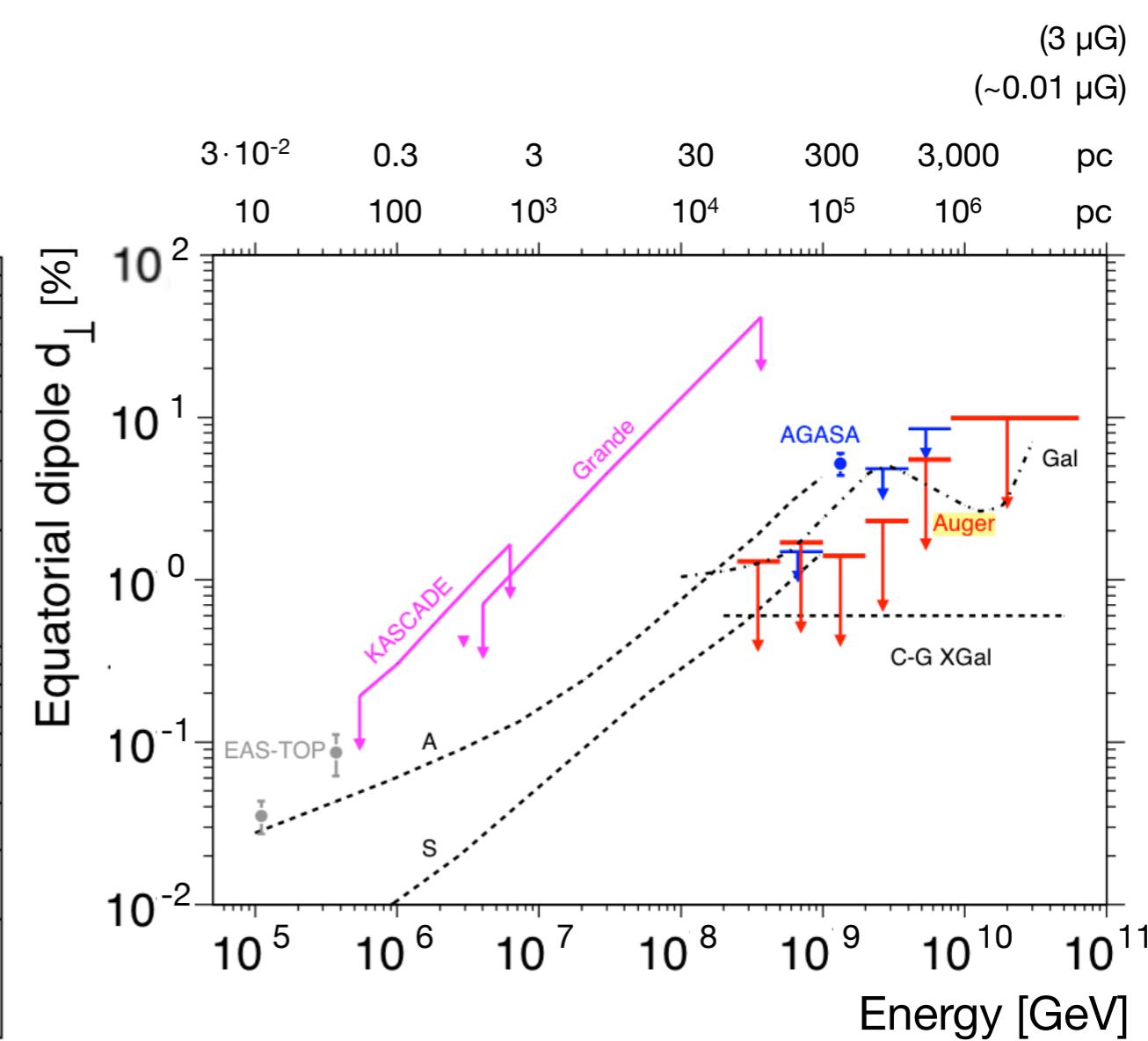
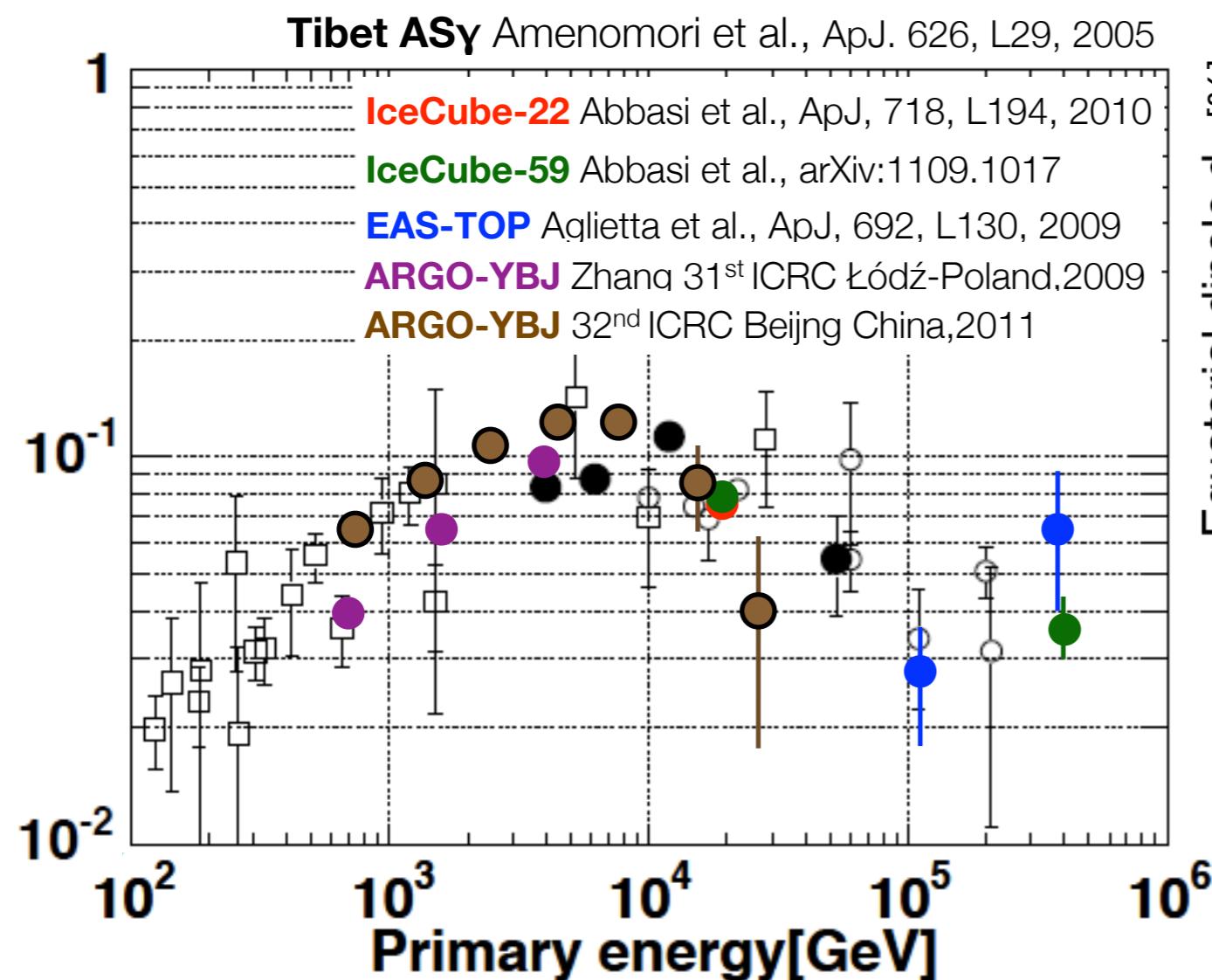
ARGO-YBJ
(time scrambling)



Tibet-III
(global fit)



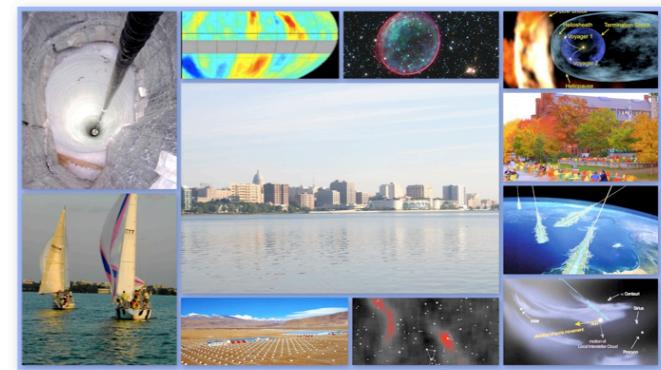
anisotropy vs energy



Abreu et al., Astrop. Phys., 34, 627, 2011

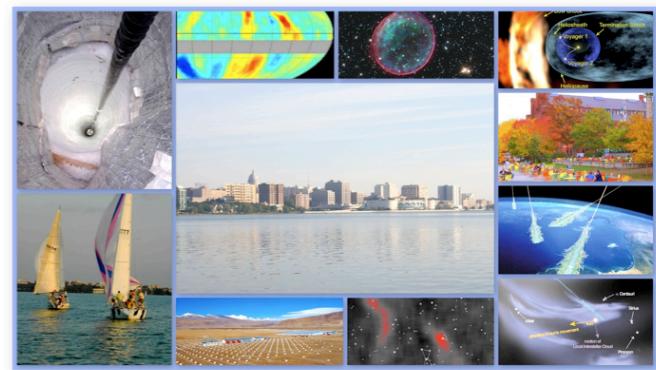
$3 \cdot 10^{-5}$	$3 \cdot 10^{-4}$	$3 \cdot 10^{-3}$	$3 \cdot 10^{-2}$	0.3	gyro-radius (pc)
7	70	700	7,000	70,000	gyro-radius (AU)

topics



- anisotropy and nearby supernova remnants and pulsars
- cosmic ray propagation through interstellar medium
- cosmic ray interaction with turbulent interstellar magnetic field
- cosmic ray interaction with heliosphere
- recent results on cosmic ray anisotropy as a function of energy and angular scale
- analysis techniques in cosmic ray anisotropy studies
 - ▶ origin of large scale anisotropy: nearby sources, ISM, heliosphere
 - ▶ origin of small scale anisotropy: propagation, heliosphere
 - ▶ spectral features and connection with CR composition
 - ▶ connection with leptonic CR anomalies, e^+/e^- , anisotropy ?
 - ▶ TeV CR as probe into heliosphere/ISM ?

Workshop agenda



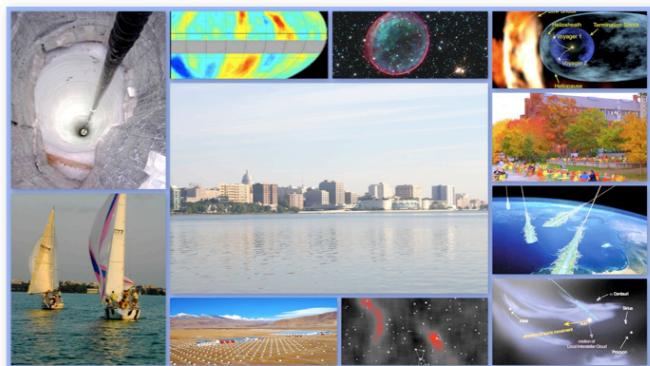
Friday

8:45am	Desiati	Intro
9:00am	Pretz Chen Iuppa Santander	anisotropy measurements Milagro ARGO/LHAASO ARGO IceCube
11:00am	Lazarian Jokipii Malkov	models & implications
11:20am		
1:00pm		
2:30pm	Gurtner Ghia Iuppa BenZvi	anisotropy measurements & methods AMANDA EAS-TOP
4:20pm		
4:40pm	Deligny Giacinti Yüksel	anisotropy measurements & models Auger
6:00pm		

Saturday

9:00am	Vasileiou Moskalenko Zank	leptonic CR, propagation, ISM Fermi GALPROP
10:30am		
11:00am	Eun-Suk Seo Boezio Hörandel Blasi	spectral features & anisotropy CREAM PAMELA
1:00pm		
2:30pm	McComas Opher	heliosphere & LISM IBEX
3:30pm		
4:00pm	Pogorelov Frisch Abbasi	heliosphere & LISM
5:00pm		
5:00pm		Banquet

Restaurants around the Pyle Center



http://bit.ly/cosmic_food



Harvest Restaurant (banquet location)

This will be the location of the workshop's banquet. Address: 21 N Pinckney St Website: <http://www.harvest-restaurant.com> Phone: (608) 255-6075



Madison Concourse Hotel (lodging)

Website: <http://www.concoursehotel.com/> Phone: 800 356 8293



Lowell Center (lodging)



Pyle Center (workshop venue)



Memorial Union

Food Court and Coffee shop available



Food carts

several food carts in front of Library Mall. Can go to Memorial Union to eat



Chipotle Mexican Grill

Fast Food



Mediterranean Cafe

Nice and small Algerian restaurant, fast to serve food



Sunroom Cafe

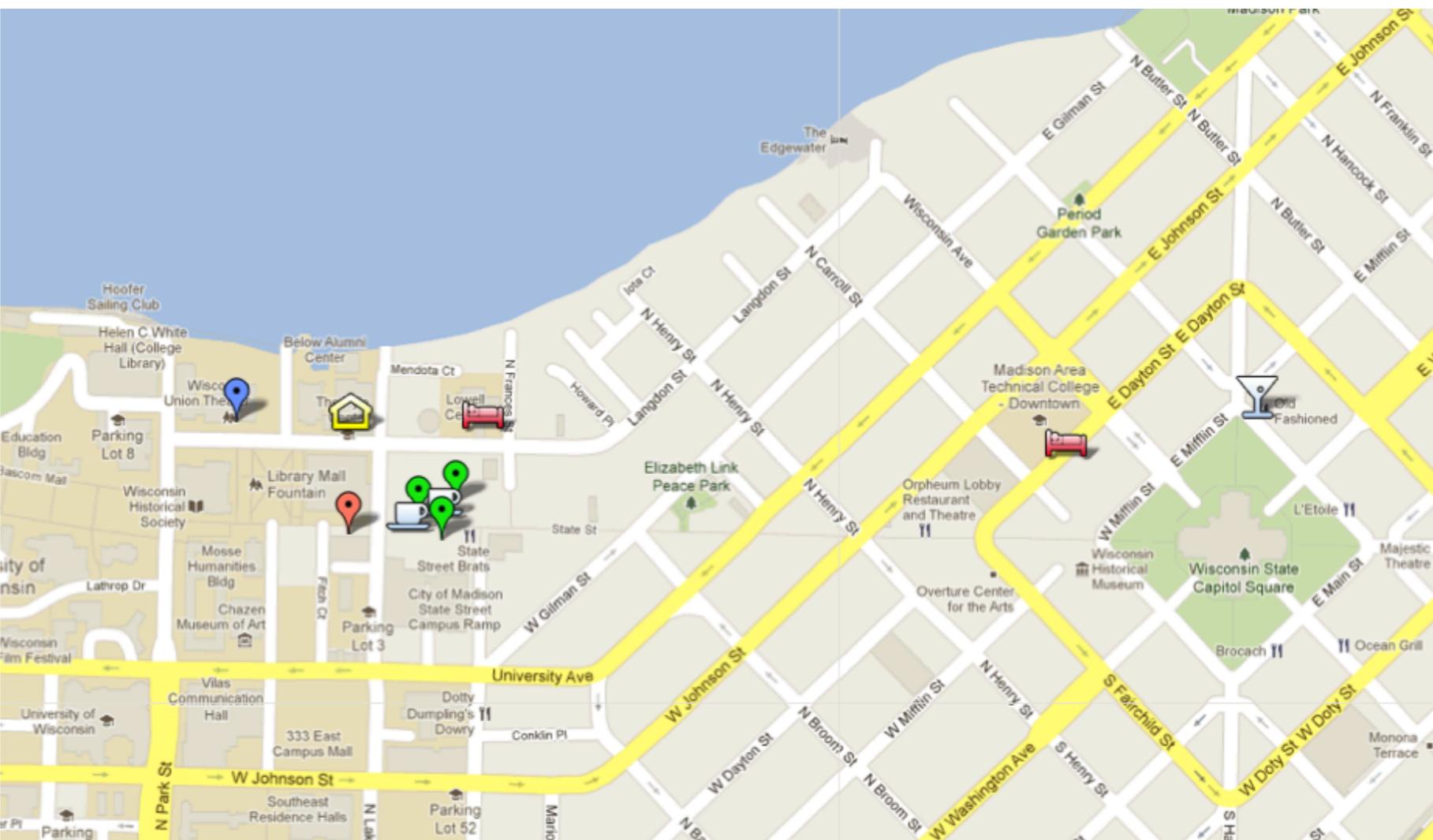
Convenient and relatively fast



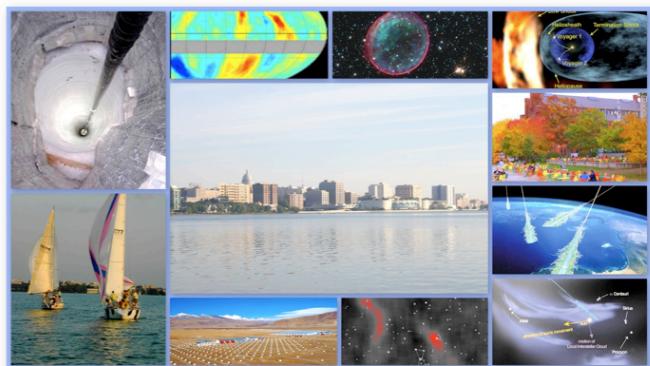
Espresso Royal



Starbucks

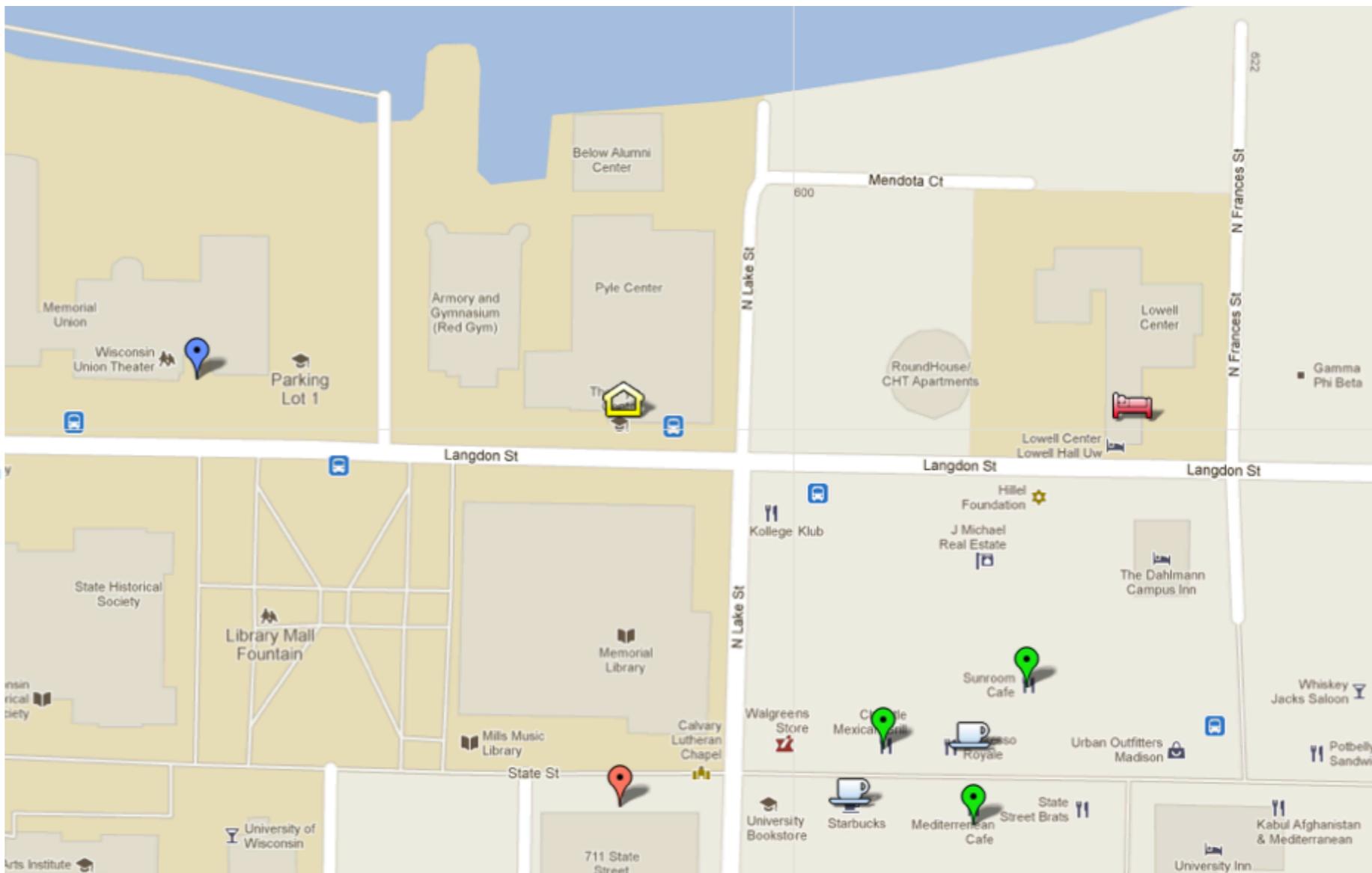


Restaurants around the Pyle Center

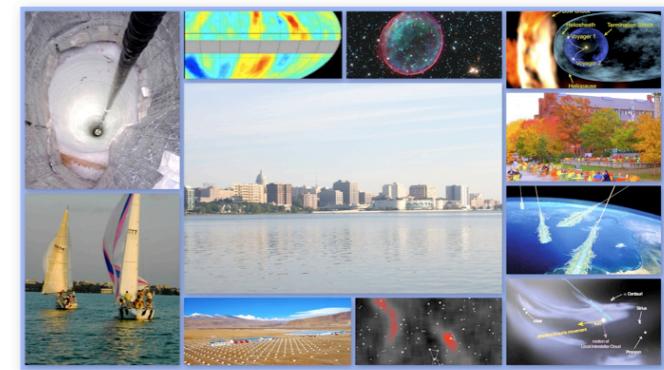


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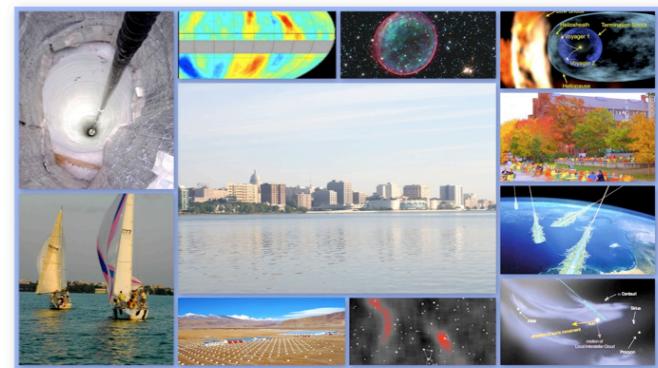
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Convenient and relatively fast
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various info



- transportation
 - if you need to schedule a cab we can help you (~20 mins to MSN; ~20 \$)
 - Concourse Hotel has complimentary shuttle to MSN airport
- internet access is in your handout information
- collect your presentations, possibly collect them in advance for the next sessions
 - go to Marcos.
- banquet tonight at 7:30pm at the Harvest Restaurant, on the Square
- any questions you may have please ask us and/or Kim



Let's start the workshop

[5] The small-scale anisotropy of the cosmic radiation: results from Milagro

by Dr. John PRETZ (LANL)
(309: 09:00 - 09:20)

[7] The cosmic ray anisotropy measured by the ARGO-YBJ experiment and the status of the LHAASO project

by Dr. Songzhan CHEN (Institute of High Energy Physics (IHEP))
(309: 09:30 - 09:50)

[2] Cosmic Ray Anisotropy at TeV energies with ARGO-YBJ

by Roberto IUPPA (INFN, Roma 2)
(309: 10:00 - 10:20)

[3] TeV and PeV CR anisotropy as observed with IceCube and IceTop

by Marcos SANTANDER (University of Wisconsin-Madison)
(309: 10:30 - 10:50)