

FKPPL Project report (2011)

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ID: Title	Astroparticle Physics: Korea U-LAPTh: Numerical Analysis on New Cosmic Ray Nuclei Data from CREAM experiment							
Project Leaders	French Group			Korean Group				
	Name	Title	Affiliation	Name	Title	Affiliation		
	<u>Pierre SALATI</u>	Professor	LAPTh	<u>Yong-Yeon KEUM</u>	Research Professor	Seoul National University (SNU)		
Funding from France within LIA								
Description		Euro/unit	Nb of units	Total (euros)	Provided by: *			
Return plane tickets from Lyon Saint-Exupéry to Seoul Incheon International		700	3	2100	IN2P3			
Part of living expenses during P. Salati's visit in Seoul from October 20 to November 1				400	IN2P3			
Total				2500				
Funding from Korea								
Description		Won/Unit	Nb of units	Total (Won)	Provided by: **			
Total								
Additional funding (outside LIA)	Funding from France			Funding from Korea				
	Provided by: ***	Type	Euro	Provided by: ***	Type	Won		
	CNRS DR11 (LAPTh) and Université de Savoie	Rest of living expenses incurred by G. Bernard, P. Salati and R. Taillet during their visit of	2300					

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		SNU to collaborate with Yong-Yeon Keum				

* For example: IN2P3, CEA. ** Korean University or Institute. *** French Embassy, STAR, PICS, other grants...

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Summary of 2011 activities	<p>Guilhem Bernard, Piere Salati and Richard Taillet from LAPTh have visited Yong-Yeon Keum at Seoul National University (SNU) from October 21 until November 1 in order to collaborate with him.</p> <p>The project aims at understanding the anomalies in the proton and helium spectra observed by CREAM at high energy, between 1 and 100 TeV. The PAMELA satellite has confirmed the presence of an excess in the energy distribution of these species above 250 GeV.</p> <p>We have started a collaboration in order to investigate the origin of these anomalies. We have so far explored the validity of the assumption of a steady acceleration for the cosmic ray primary nuclei. Up to now, everybody has assumed that the sources of cosmic rays act steadily and can be described by a homogeneous distribution in space and time. But cosmic rays are accelerated by the shock waves driven by supernova explosions. These are actually localized in space and time. Treating them as a continuous jelly with a continuous rate of cosmic ray injection in the Galaxy may not be correct, at least above a few hundreds of GeV. This is the topic of Guilhem Bernard's thesis and the LAPTh team has already made some progress in calculating the contributions (i) from local and recent sources on the one hand, and (ii) from distant or old sources on the other hand. We have also calculated the variance associated to each contribution – local and remote – and we have shown that the nearby supernovae – nearby in space and time – completely dominate the variance of the proton and helium nuclei fluxes. We have used a catalogue of the known nearby supernovae based on observations of supernova remnants (SNR) and pulsars. Their contributions to the proton and helium fluxes can be calculated and turns out to be significant above 1 TeV when compared to the yield from more remote or older sources. The variance of the proton and helium spectra becomes small once the catalogue of local sources is taken into account. That variance arises from our lack of knowledge of the remote sources which need to be treated statistically. A paper is in preparation and will be signed by the LAPTh team associated to Timur Delahaye, from Madrid, who has joined the collaboration and made significant progress on the catalogue of local sources. Our visit to SNU has allowed us to elucidate a few points and to understand how local sources contribute to the proton and helium fluxes.</p> <p>We have then turned to the question of the anomalies themselves. We have found a set of cosmic ray propagation parameters for which we can explain at the same time the bulk of the proton and helium spectra and the PAMELA and CREAM anomalies. Although the CR propagation parameters at stake are slightly out of the range allowed by the B/C ratio measurements, we are very excited by our simple explanation in terms of local sources. A letter to PRL will soon be submitted and we actively collaborate with Yong-Yeon Keum on it. He will sign the letter with us. We intend to write it next January/February when Yong-Yeon Keum visits the LAPTh team at Annecy.</p>
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Publica- tions since 2007	Nothing yet but hopefully, an article in A&A and a letter to PRL will be soon submitted.
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