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Hazards and Risk @ SLR Network, Updates and New Challenges

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Abstract. *The situation update since the 2011 17th workshop, on the most common natural hazards that could affect the SLR network is presented in this paper.*
Two challenges that could be addressed in the next years are introduced:
1) *To create a common database related to the Air Traffic – SLR interactions, in which all the security laser switch-off events could be recorded, and*
2) *On the usefulness to compile a "best practices & hazard management book" in order to concentrate in a single source all the practical experiences accumulated at the ILRS stations.*

Introduction

At the 2011 17th SLR workshop in Bad Koetzting, Germany the basic concepts on the field of Risk & Hazard management were introduced to the SLR community and a survey of the most common natural hazards related to the SLR network were presented. (del Pino, 2011)
In this paper the current situation regarding five of the hazards with higher impact were reviewed.

Human Factor:

Every year the SLR community losses more founding members and, combined with retirement, means that a global generation handover will occurs in the next 5-10 years. The need to preserve the historic memory and practical experience of the former and current generations of observers becomes more and more urgent (Salminsh K., del Pino J. R., 2013)

Forest fires:

This hazard has become a recurrent risk for those stations operating in a non-urban forest environment. In the last 10 years three forest fires has affected SLR stations with the result of one SLR station destroyed and two had to be temporarily evacuated. The need to create and regularly update a comprehensive fire preparedness program at these SLR stations is evident.

Earthquakes:

In 2011 a homogeneous method to estimate the seismical hazard at the SLR network was presented. The idea is to use the USGS global database of strong quakes, to count the quakes numbers and magnitudes on each station in radius of 250, 500.1000 and >1000 km. This results as a classification for quake hazard in four levels of: Very low, Low, Medium and High (At risk) seismic hazard
The full results were presented in (del Pino, 2011).
The seismic hazard situation update for 2013 is:
All the SLR stations already evaluated in 2011 stays on the same hazard level
The ranking for the stations on the High (At risk) classification is in all practical sense the same.
For the 5 new stations in operation since 2011, plus the future place for TIGO/La Plata, Argentina, the classification table using the criteria of most intense quake in the closest active areas is shown in the table 1, all other criteria gives the same results.
The quakes amount and relative ranking for the "at Risk" stations for 2013 are shown in table 2.

Table 1: The most intense quake classification criteria for the new SLR stations.

Station/Hazard level	Magnitude	Date	Distance
High (At risk)			
Arkhyz	7.0	29/4/1991 9:12	225.3
Zelenchukskaya	7.0	29/4/1991 9:12	226.4
Medium			
Badary	7.5	05/1/1967 00:14	409.8
Daedeok	6.6	20/3/2005 01:53	381.4
Low			
TIGO@La Plata	8.2	30/1/1914 00:00	770.5
Baikonur	7.6	02/11/1946 18:28	871.6

Table 2: 2013 Earthquake statistics and relative ranking for the "High (at Risk)" SLR stations. New SLR stations highlighted in bold Italics

Station	<250	250-500	>500		Rank	Station	Points
Concepcion	19	19	36		1	Simosato	22
Koganei	19	59	75		1	Koganei	22
Simosato	16	37	83		1	Arequipa	22
Arequipa	13	21	58		2	Concepcion	24
Tanegashima	12	5	59		2	San Juan	24
Graz	4		4		2	Tanegashima	24
Haleakala Maui	4		4		3	Monument Peak	27
San Juan	4	35	58		4	Beijing	30
Beijing	3	3	6		5	Haleakala Maui	31
Matera	2	15	46		6	Kunming	33
Kunming	2	13	25		6	Graz	34
Zelenchukskya	2	11	23		7	***Arkhyz***	37
Arkhyz	2	11	22		7	***Zelenchukskaya***	38
Katzively	1	11	46		7	Matera	39
Simeiz	1	11	45		8	Simeiz	45
Monument Peak	1	2	13		8	Katzively	45
San Fernando	1	1	4		9	San Fernando	47

Hurricanes/Typhoons:
No active SLR station was affected by hurricanes/typhoons in the time period covered, however the effects of Hurricane Sandy at the former SLR station 1953 in Santiago de Cuba were presented.

CDI: Computer, Data and Internet Security:
Only a remind to backup, save the old formatted data and upgrade the hack protection was issued.

New challenges

In-Sky Laser Safety events database:
In order to prevent the illumination of airplane cockpits by the lasers used at the SLR stations, different technologies has been put into operation to guarantee switching off the laser source when an airplane approaches the laser beam.
We propose to call this as ***SLR-Air Traffic interaction events.***
With the increased number of SLR stations using ADS-B receivers giving the 3D airplane coordinates in real time, there is now the possibility to generate a reliable database of these events.
One initial format proposal for the database was presented.

Table 3: proposed variables and format for a SLR-Air Traffic interaction event database.

Variable	Format/Type
Station Id:	Numerical/4 letter/Name
Event Epoch:	yyyy/mm/dd, hh:mm and/or mjd.mjd
Unit used to define an event:	1=Degrees, 2=Km, 3=nm ...
Distance criteria to define an event:	numerical value
Minimum distance to laser beam:	numerical value
Airplane position at min distance:	Az, El, Range, Id (if available)
Satellite Code:	Cospar Code/Satellite name
Numerical code for the technology used	0=ADS-B, 1= Radar, 2=optical ...

On the creation of a best practices & hazard management book:
The idea to create a compendium of recommendations and practical experiences on the design, building and operation of a SLR station was presented, and the pros and cons of carry out this project discussed.

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