



La-140 and Ba-140 Background from IMS particles stations

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Introduction

This work focuses on detections of La-140 and Ba-140 from radionuclide particulate stations of the International Monitoring System (IMS). These two isotopes are relevant radionuclides of CTBT and are sometimes detected with abnormal concentrations. The mapping of this background and the analysis of their time series level is a helpful tool than can be used to characterize the activity background of both parent-daughter radionuclides in the world. For that purpose, following questions are investigated: what are the statistics detections of both radionuclides in the IMS? Do 2010 detections from RN37 studied by many scientists are particular?

IMS Data used in this study come from all IMS particles stations and recorded between 2010/01/01 and 2017/01/01.

Statistics on the detections

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Total	130			
	La-140	Perc.	Ba-140	Perc.
2010	8	6%	9	7%
2011	119	92%	34	26%
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	2	2%

Table1: Statistics on the detections of La140 and Ba140. The main detections are located in 2010 and 2011. we can notice that the numbers of detections in IMS between 2010/01/01 and 2017/01/01 are 127 (97,7%) and 45 (34,6%) respectively for La-140 and Ba-140.

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La-140 and Ba-140 detections in IMS

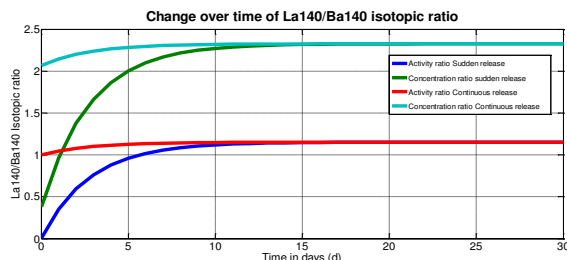


Figure 1: Change over time of La140/Ba140. the activity ratio increases and reaches its equilibrium level at 1,1516. Concentration is also increasing until its equilibrium level at 2,3265

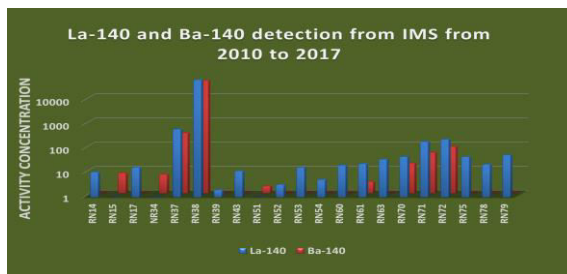


Figure 2: Detection between 2010 and 2017. The most detections come from IMS particle station RN38

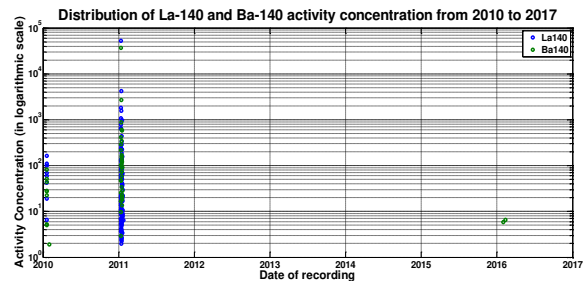


Figure 3: Distribution of detections from 2010 to 2017. No double detections between 2012 and 2017

Distribution of activity concentration

From IMS particles stations of CTBTO, The main double detections of La140 and Ba140 have been made in 2010 and 2011 (fig.3) in the stations RN37 and RN38..

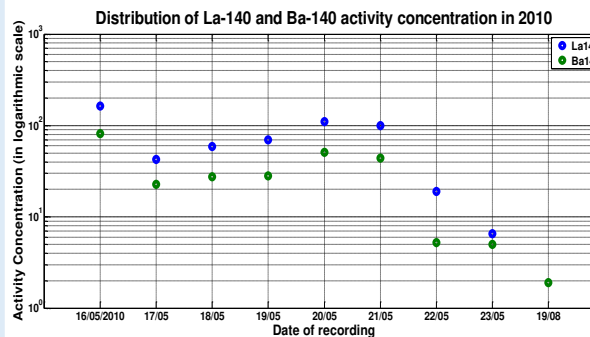


Figure 4: Distribution of detections in 2010.

The highest values measured are recorded on 2011/03/21 at RN38 corresponding to 52444,80(9948) for La140 and 36954,79(83257) for Ba140. RN37, RN38, RN71 and RN72 are the stations where La140 and Ba140 were recorded with activities concentrations higher than Lc.

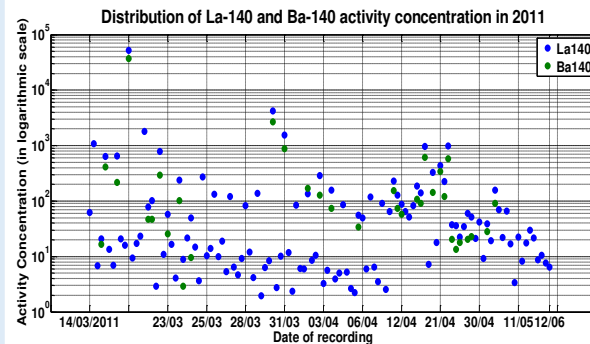


Figure 5: Distribution of detections in 2011

Discussion & Conclusion

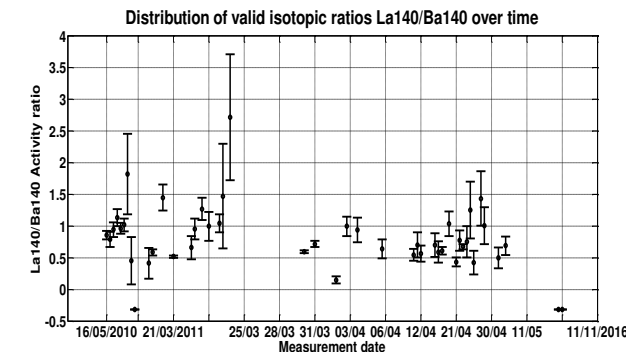


Figure 6: Distribution of useful activity ratios La140/Ba140.

From these 130 detections of La-140 and Ba-140 between 2010/01/01 and 2017/01/01, 42 (32,3%) give useful activity ratios that can be use in event timing, where 33 (27,4%) and 07 (05,4%) are respectively useful for a sudden and a continuous release condition.

Some of these double detections of La140 and Ba140 were investigated by authors since 2012, like DE GEER (2012), De GEER (2013), IHANTOLA (2014), YAMBA (2016). The detections from 15 to 22 May 2010 at RN37 located at OKINAWA – JAPAN give an estimated date of release between 2010/05/10 and 2010/05/13.

In conclusion, this work shows that the 2011 detections can be associated to Fukushima debris, but the 2010 detections remain clearly unexplained. Further works have to be made on these detections of La140 and Ba140 mainly those from RN38 and RN37.

References

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