Search for neutron stars in deep optical pointings

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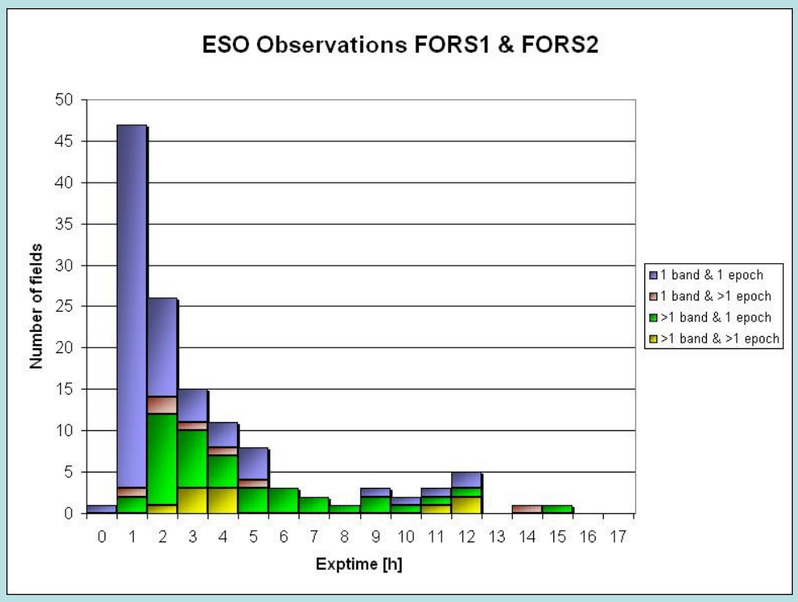
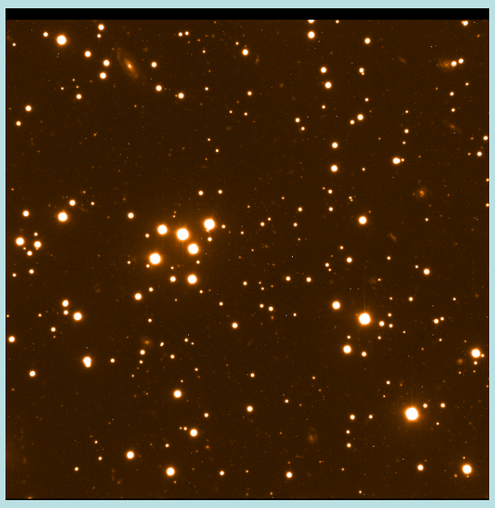
About 130 fields can be found in the ESO Archive from the VLT/FORS with exptimes >1h.
→ The fields including several epochs with long exptimes are from special interest to find **fast moving faint objects**.



Mission: Find fast moving objects using pointings of several epochs!

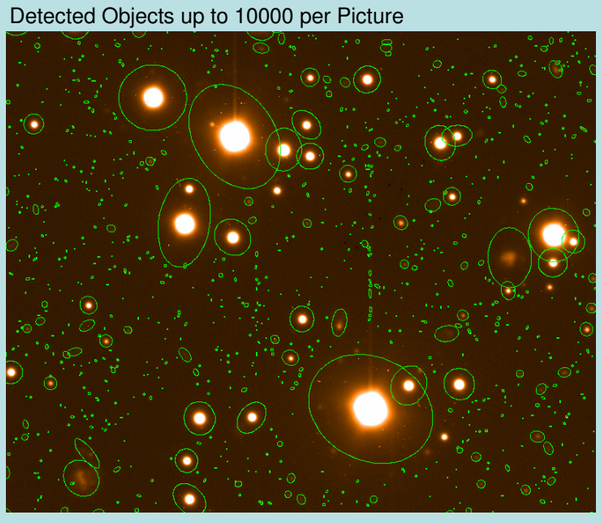
(This example deals with the already known neutron star RX J0720 [Haberl et al.])

Pointing from December 2002 after reduction & sum up



Gaia object detection

Detected Objects up to 10000 per Picture



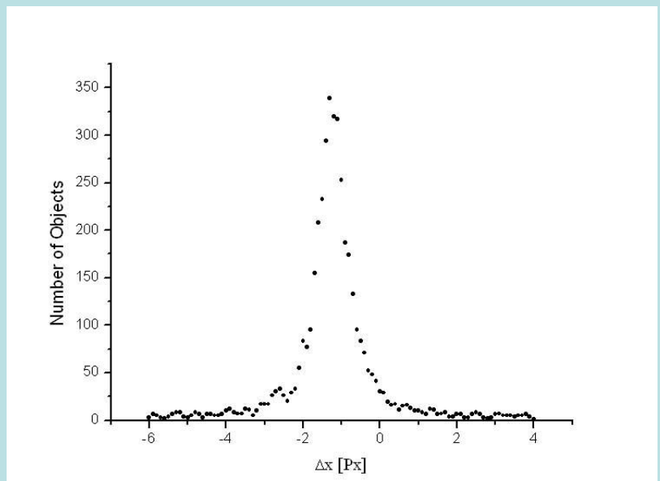
data extraction

Positions & relative magnitudes

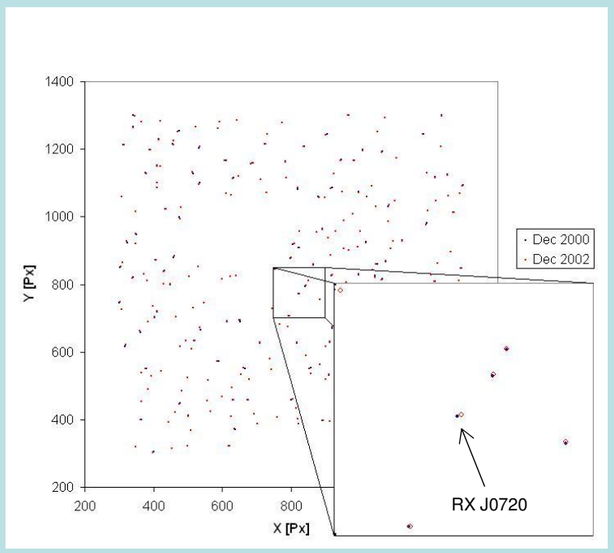
	A	B	C	D	E	F
1						
2	NUMBER	X_IMAGE	Y_IMAGE	FLUX_ISO	MAG_BEST	
3	------	-------	-------	--------	--------	
4	1	111,441	15,164	0,0227579	54,6342	
5	2	88,023	21,312	0,0431868	53,456	
6	3	1825,32	32,406	0,602206	50,7198	
7	4	417,995	40,78	0,188938	52,2925	
8	5	881,849	55,378	0,00899343	55,5125	
9	6	1160,911	55,379	0,0117838	55,677	
10	7	303,503	56,232	0,00383829	55,7774	
11	8	582,032	56,304	0,00293699	55,3294	
12	9	1342,765	56,344	0,00458723	55,2279	
13	10	1581,944	56,537	0,00294482	55,808	
14	11	611,516	53,281	0,0169058	54,9704	
15	12	1001,058	56,138	0,00395214	55,9311	
16	13	837,02	56,667	0,00537004	55,7499	
17	14	849,64	57,266	0,00721532	55,5372	
18	15	1387,7	57,008	0,00380745	55,9067	
19	16	511,11	57,956	0,0238601	54,2368	
20	17	773,02	56,382	0,01251	54,8137	
21	18	940,855	57,232	0,00819764	54,6054	
22	19	1070,612	57,545	0,0140158	54,6807	
23	20	787,005	58,525	0,0152932	54,4685	
24	21	1367,193	58,16	0,00961857	54,8781	
25	22	404,751	93,564	0,00180604	56,202	
26	23	262,875	91,991	0,0291844	53,8766	
27	24	961,981	95,517	0,00184453	55,9973	
28	25	1165,958	93,978	0,00280756	55,8612	
29	26	1418,443	95,173	0,00329014	55,6953	

- Gaia object detection supplies up to 10000 objects in each epoche.
- A program helps to correlate the objects in each table and reduces the total number to 50% roughly matching.
- A Gaussian fit over the distances supplies the mean shift parameters and the standard deviation.

Distances between matching objects in several periods



Matching objects of the two periods



- Now filtering out the brightest objects and those barely moved results in a couple of faint and fast candidates.
- These candidates must be checked by eye in the pointings. Some were obviously misdetected (bad pixels for instance).
- Finally there are (maybe) a few fast moving (≥100 mas/yr) and faint (≥26 mag) objects. – **Neutron stars?**

If pointings in different colors are available (especially IR), then IR-detected candidates are probably no neutron stars.

Future follow-up: 3rd epoch, other bands (color), radio, X-ray.