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ОБСЕРВАТОРИЯ
ПРАО

On the correlation of IR and optical variability in NGC 4151

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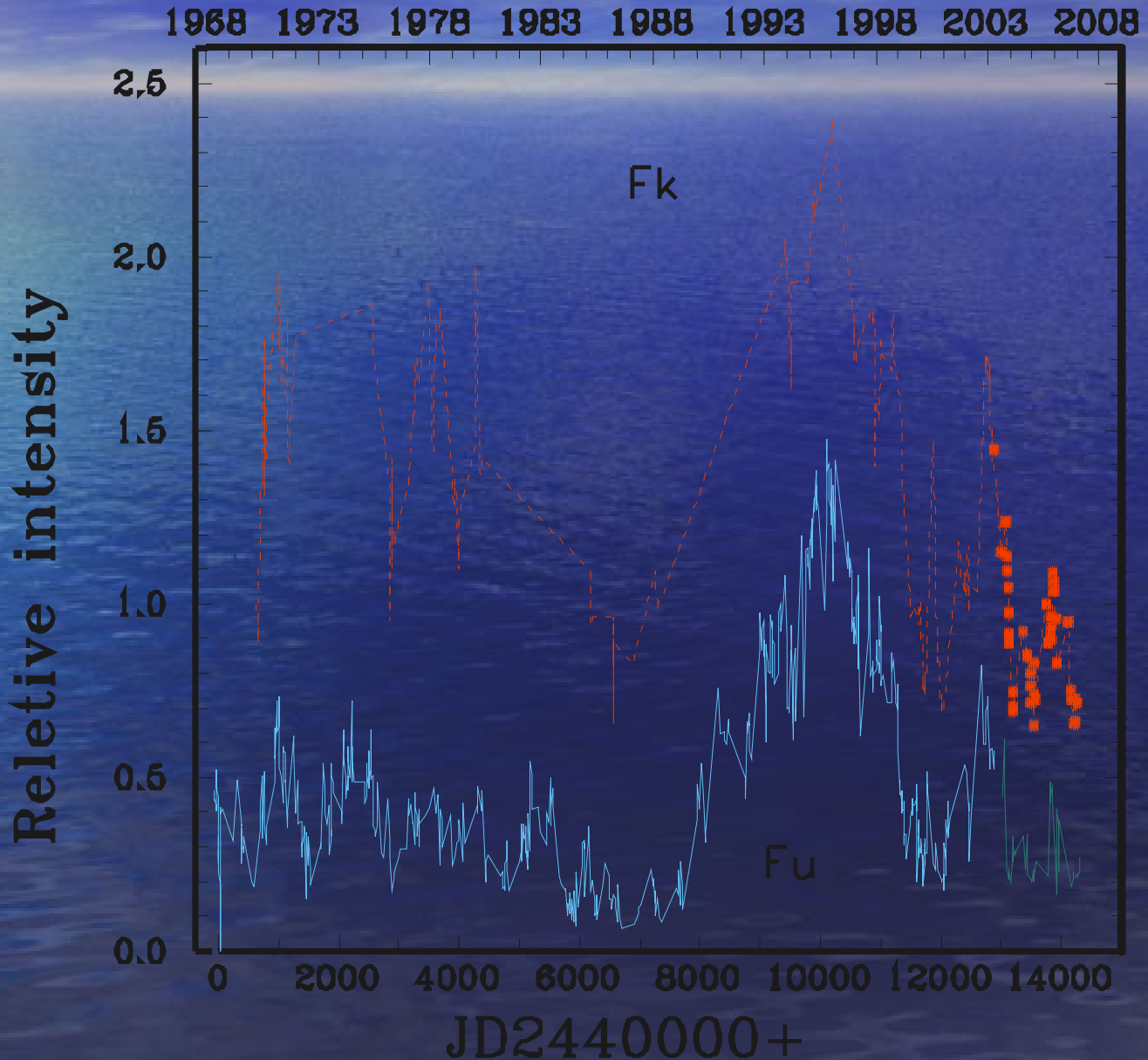
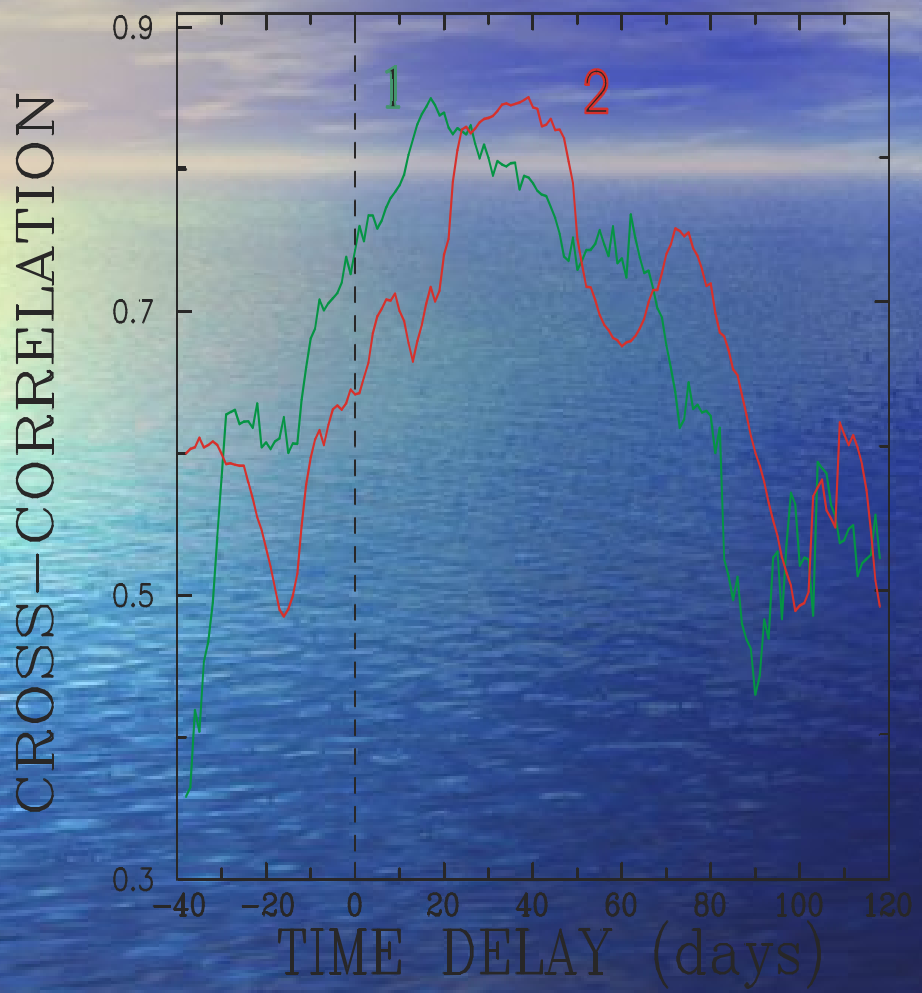
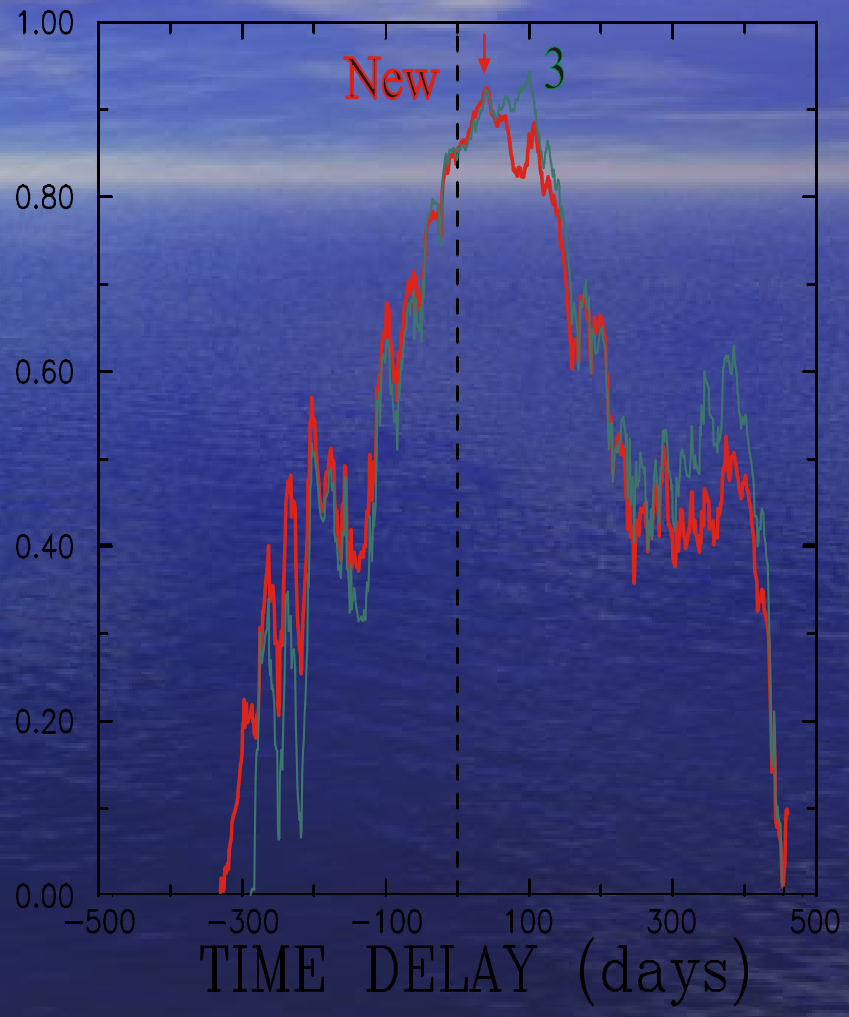
- We combine all published and new unpublished NIR photometrical observations of NGC 4151 which can be used for determination of time delays between optical and NIR variations. In previous study we have found that the values of time delay in NIR filters are not the same for different states of the luminosity. Here we consider the new photometrical data for the deep minimum in 2003-2006 following the very high state of the nucleus. We conclude that after sublimation in high state of nucleus the dust particles were recovering during at least several years.

Combined light curves of NGC4151 from 1968-2007 in two bands, K (red line) and U (blue line) ([1]—[3] and new data).



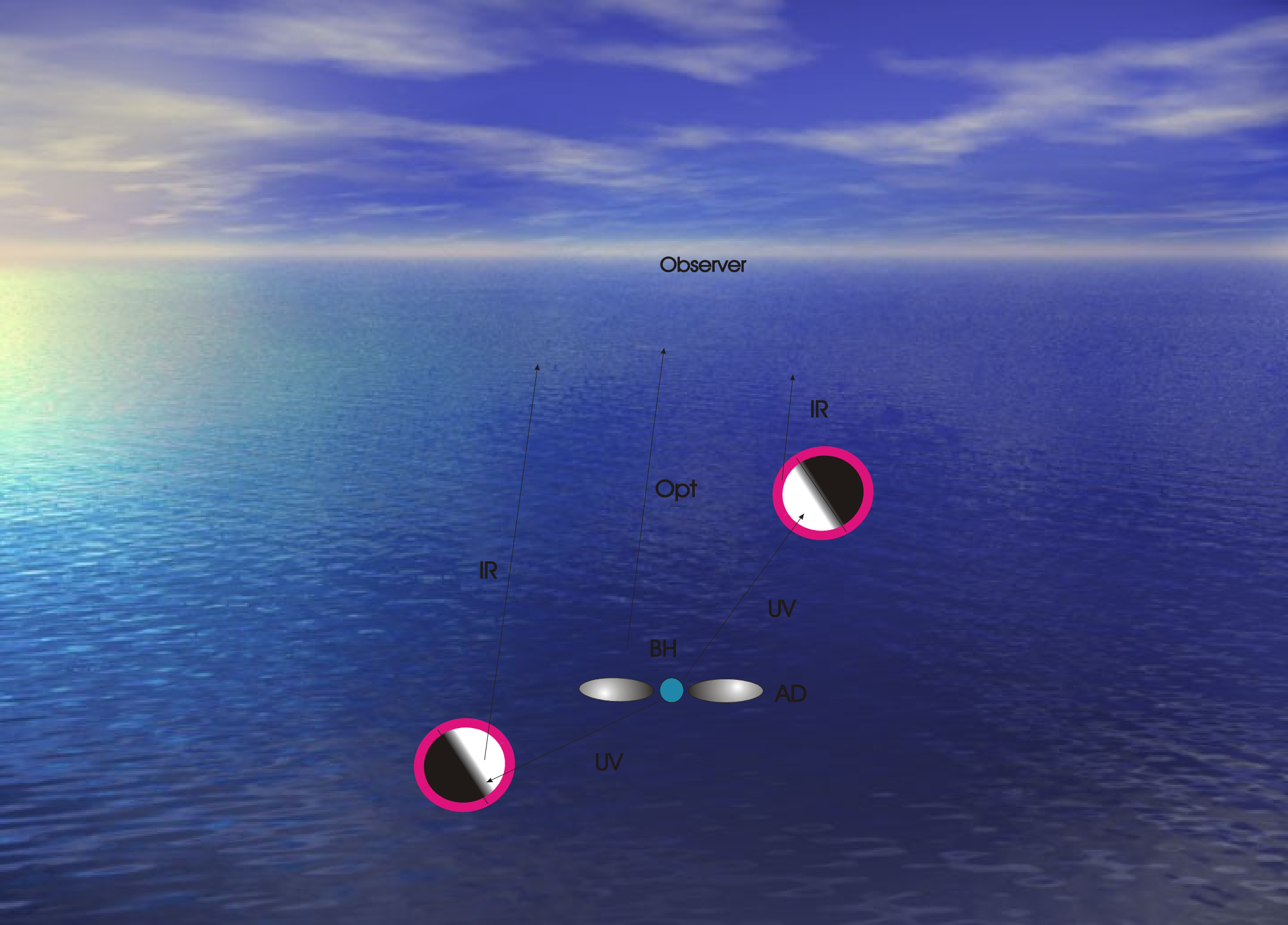


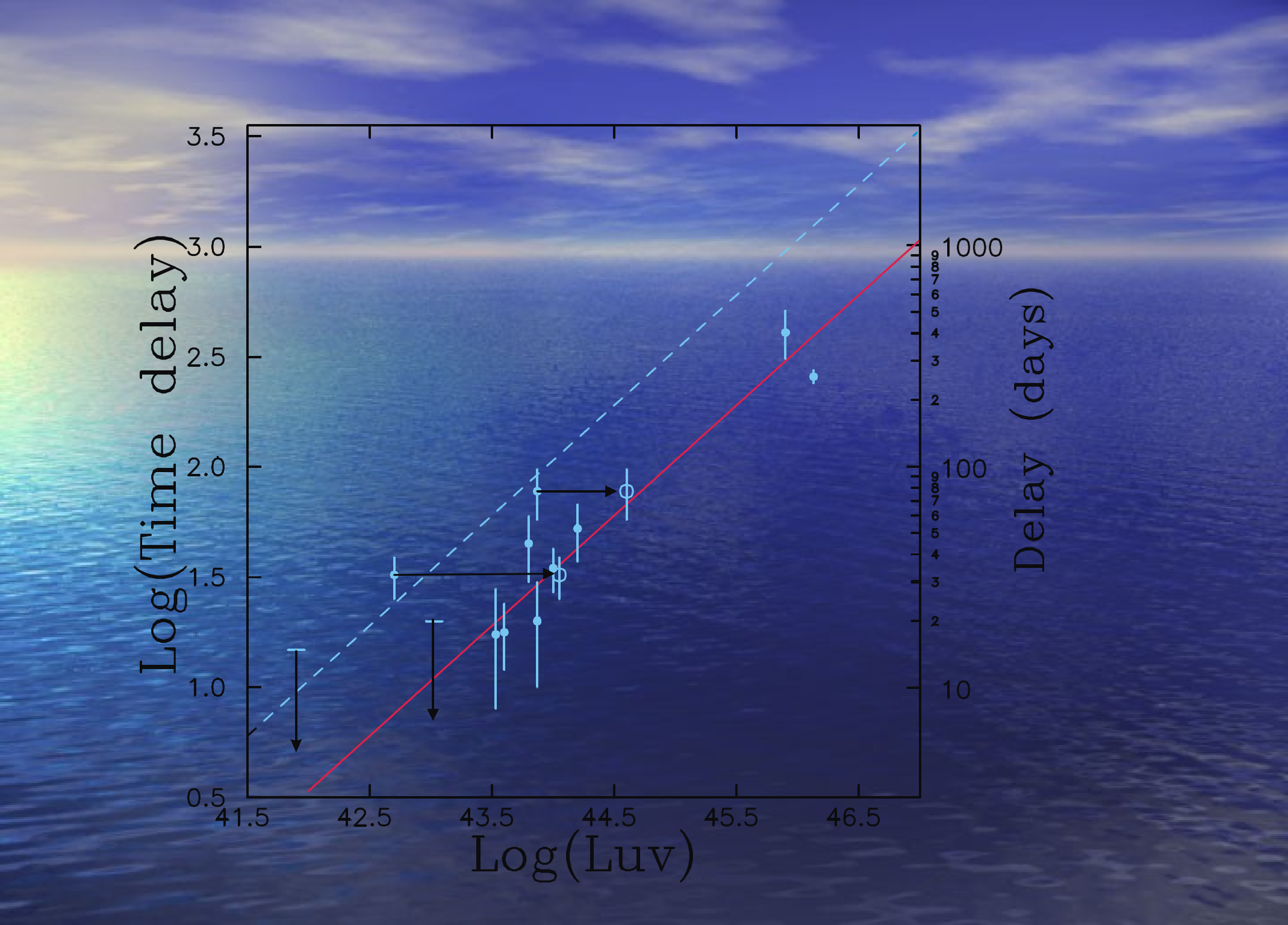
Cross-correlation between flux variations in filters U and K in two intervals 1 and 2 [1, 2].



Cross-correlation between flux variations in filters U and K in two intervals 3 [3] and *New*.

Time delay, days (1 from 2)	Filter 1(2)	Time Interval	References
18± 6	*K(U)*	1969-1980	[1]
24± 6	*L(U)*		
35± 8	*K(UBV)*	1985-1998	
8± 4	*H(UBV)*		[2]
97± 10	*L(UBV)*		
104 ± 10	*K(UBV)*	1998-2003	[3]
94 ± 10	*H(UBV)*		
105 ± 10	*L(UBV)*		
41 ± 5	*K(U)*	2003-2006	New results
41 ± 5	*H(U)*		
105 ± 5	*L(U)*		
94 ± 10	*L(J)*		
37 ± 5	*K(U)*	2003-2007	


Observer
IR
Opt
IR
UV
BH
AD
UV


3.5
3.0
2.5
2.0
1.5
1.0
0.5
Log(Time delay)
41.5
42.5
43.5
44.5
45.5
46.5
Log(Luv)
1000
100
10
Delay (days)

- Summary

- It was found before for a sample of 10 AGNs with $z \leq 0.165$ that the distance from the central source to the NIR (dust) regions increases with UV luminosity as $L_{UV}^{0.5}$ [4]. Our investigations of NGC 4151 during more than 30 years show that the time delay in filter K is variable but not following exactly to the relation *delay* $\sim L_{UV}^{0.5}$. Possible explanation of this result may be connected with sublimation of the graphite grains during high level of UV continuum. According to our result the dust recovering or recreation time should be not less than several years.

- One of the possibilities is that the dust particles (graphite grains) can survive during the powerful outbursts in deep places of gas clouds and then some time to move close to cloud's surfaces can be needed.

- Alternative explanations can be anisotropy of radiation field, shielding of the central source on the light of sight and also special orientation of the dust region, as well as real physical changes in the NIR emission region during the period of our study.

References

- [1] Oknaynskij, V.L., 1993, Astronomy Letters, 19, 416
- [2] Oknyasnkij, V.L., Lyuty, V.M., Taranova, O.G., & Shenavrina, V.I. 1999, Astronomy Letters, 25, 483
- [3] Oknyasnkij, V.L., Lyuty, V.M., Taranova, O.G., & Shenavrina, V.I. 2006, ASP Conf. Ser., 360, 75
- [4] Oknyanskij, V.L. & Horn, K. ASP Conf. Ser., 282, 330

Thanks