# Highlights from Microlensing events found in Gaia Science Alerts

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## Gravitational microlensing

#### Theoretical lightcurve

- Paczynski curve (Paczynski 1986, 1996)
- Model parameters for single lens:
  - impact parameter  $u_0$
  - time of maximum  $t_0$
  - timescale of event t<sub>F</sub> (Einstein time)



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## Importance of microlensing

- Microlensing does not require light from the lensing object => detection of dark objects:
  - planets
  - dark remnants: white dwarfs, neutron starts and <u>black holes</u>
- Analysis of the structure of the Milky Way (optical depth for microlensing)



# Microlensing and Gaia

- Gaia has low cadence (on average 1 point/30 days)...
- .. but observes the entire Milky Way => providing alerts in both North and South Galactic Disk
- Gaia is an astrometric mission
- Possible detection of astrometric microlensing





around 30 events







## Highlights from 2019

![](_page_8_Figure_1.jpeg)

#### Your data matters!

![](_page_9_Figure_1.jpeg)

![](_page_9_Figure_2.jpeg)

We can not say if that is a standard or non-standard event

### Your data matters!

![](_page_10_Figure_1.jpeg)

With detailed, multi-band follow-up we can say if that is a standard or non-standard event

Plus it helps with obtaining correct parameters of the event => what kind of lens we are observing (black hole or a star?)

![](_page_10_Figure_4.jpeg)

## Long microlensing events

![](_page_11_Figure_1.jpeg)

![](_page_11_Figure_2.jpeg)

![](_page_11_Figure_3.jpeg)

![](_page_11_Figure_4.jpeg)

## Long microlensing events

![](_page_12_Figure_1.jpeg)

![](_page_12_Figure_2.jpeg)

![](_page_12_Figure_3.jpeg)

#### Summary

- Gaia is important for microlensing, because it can detect events in the entire Milky Way and provides submilimiter astrometry
- Gaia Science Alerts detection of microlensing events has improved <u>SIGINIFICANTLY</u> in 2019
- Gaia cadence is too low, follow-up is vital for microlensing in Gaia
- Long events are being monitored

![](_page_13_Picture_5.jpeg)