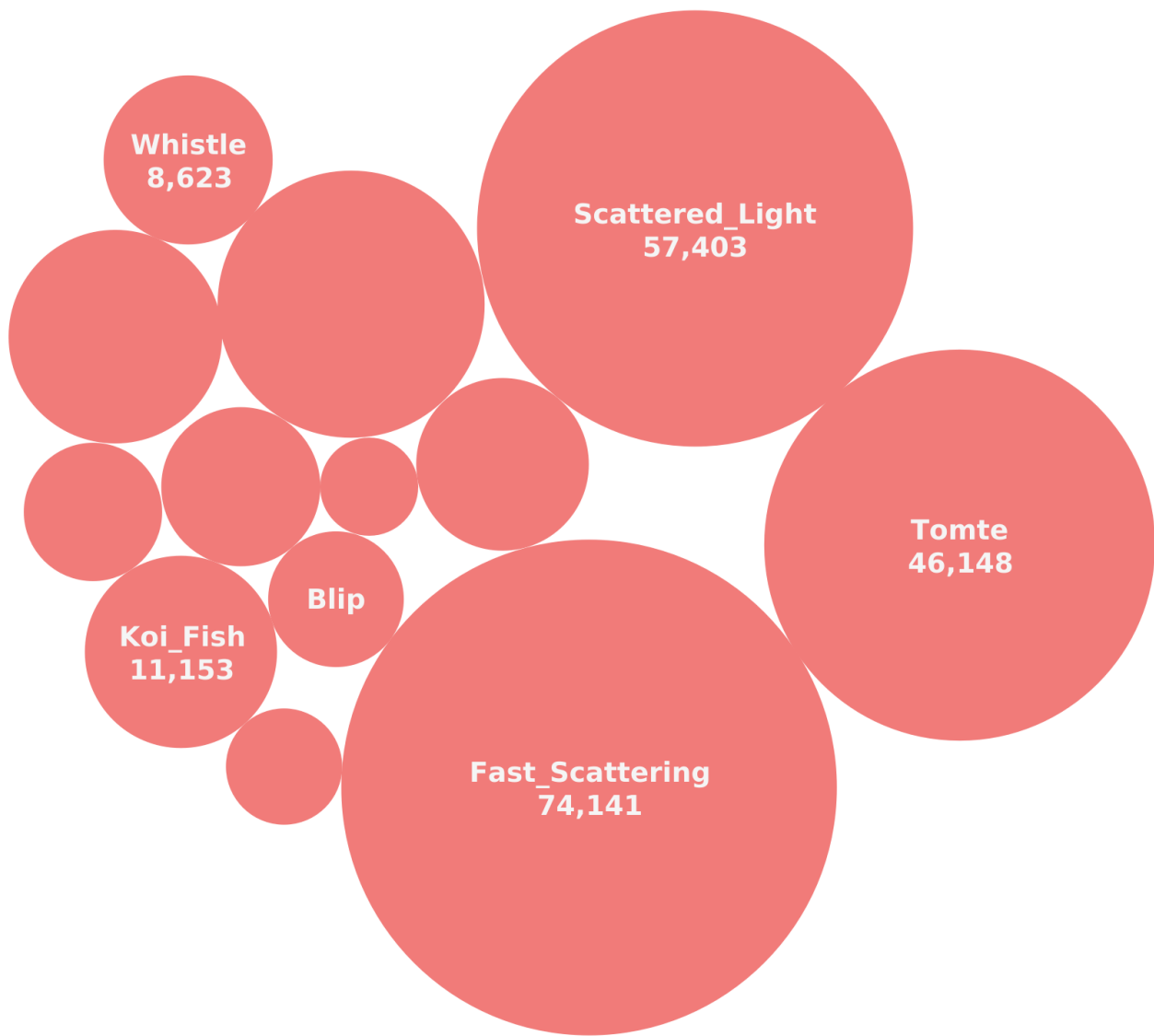




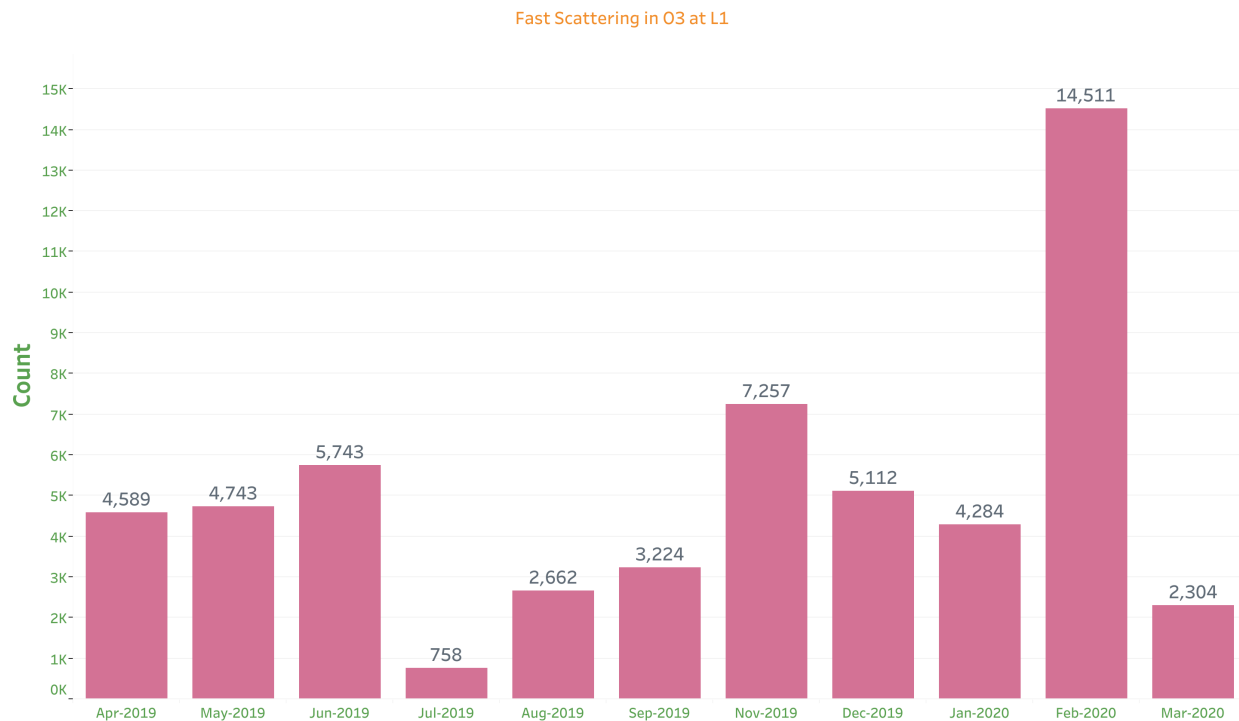
Using Tableau visualization to perform noise analysis

Types of glitches



There are multiple types of glitches, also known as short duration noise in the LIGO gravitational wave observatories. The above plot shows the name and the count of different types of glitches at LIGO Livingston between April 2019 and March 2020. We will focus on the most frequency glitch source "Fast Scattering" of which occurred approximately 74000 times.

This plot shows the number of Fast Scattering glitches (short duration noise) at LIGO Livingston Observatory between April 2019 and March 2020. We see a huge spike during February. And this is because of increased ground motion during this month, which is the main cause behind this noise.



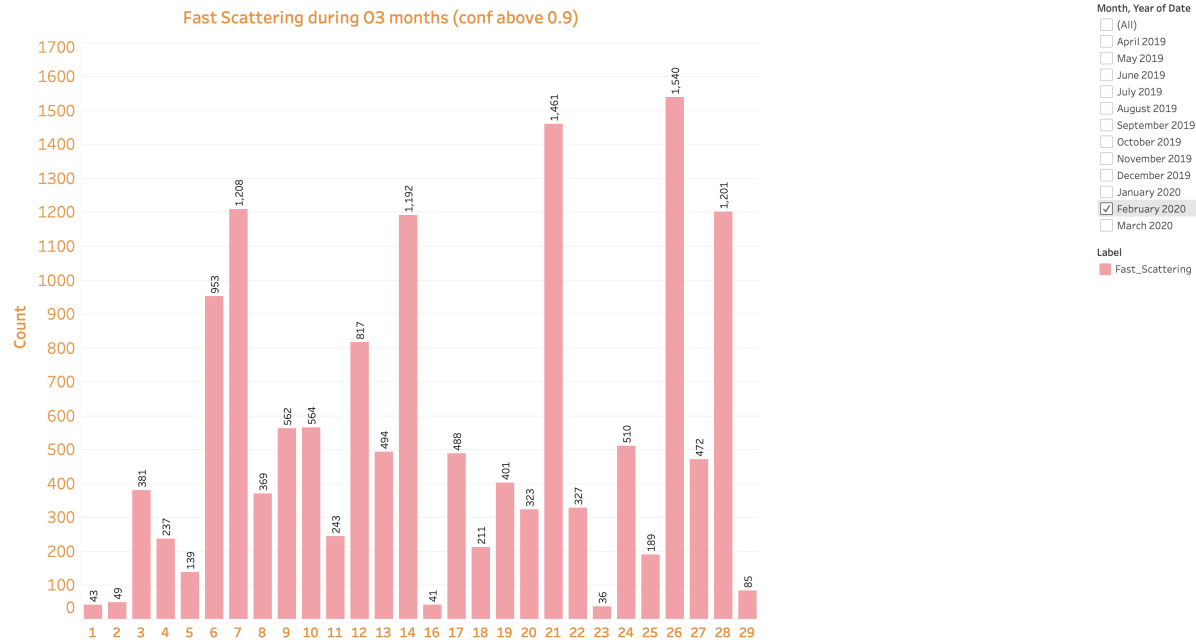
These publications by me contain more details on this noise and its reduction.

<https://arxiv.org/abs/2103.12104>

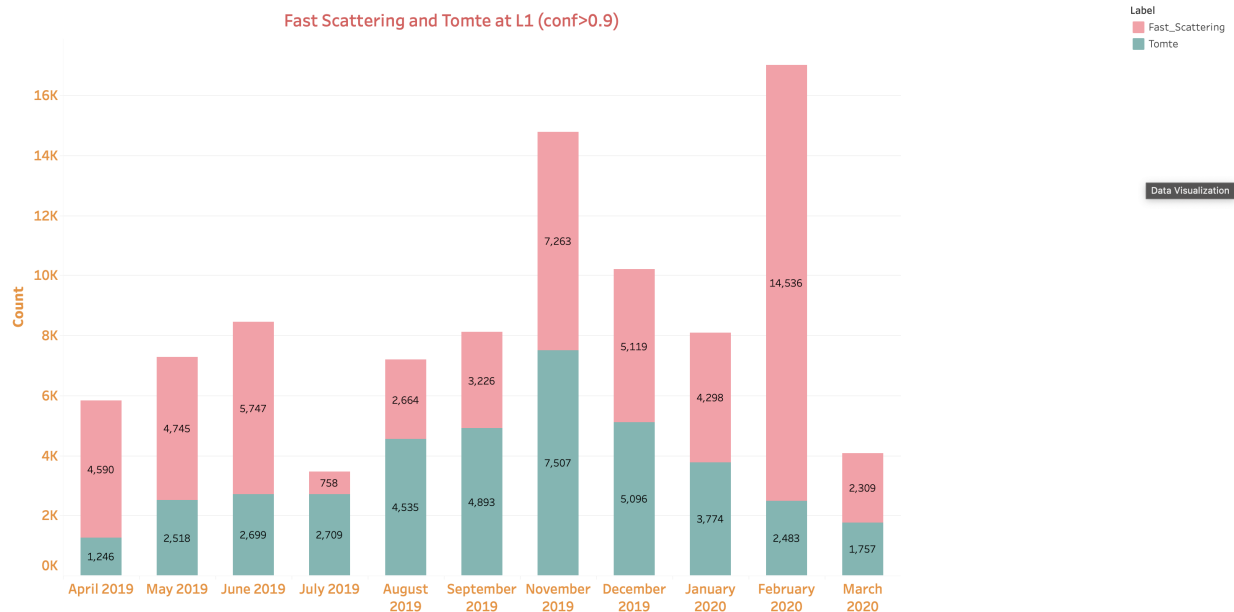
<https://arxiv.org/abs/2311.05730>

The next figure and here is the interactive [link](#) to play with different options shows the date wise fast scatter for any given month between April 2019 and March 2020. The option to select the month is on the top left.

This plot shows that within February, some days particularly stand out such as Feb 7, Feb 21, Feb 26 and Feb 28 and sure enough, these days had an elevated ground motion compared to other days.



But Fast Scattering is not the only type of glitch at LIGO, we have several others and one particularly prominent is called Tomte. This next Tableau plot shows the number of Fast Scattering and Tomte glitches for each month.



This plot shows that Tomte and Fast Scatter noise does not correlate well with each other. And since we know the rate of Fast Scatter goes up with ground motion, we can say that Tomte is not impacted by ground motion. The month with highest amount of Fast Scatter i.e. February 2020 had a rather low number of Tomte glitches.

The pattern we see is that the number of Tomte glitches increase steadily between April 2019 and Nov 2019 and then steadily decline back. What could be causing this behavior? It's a mystery.