



# MAKING CHIME LOOK BAD!

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or: Setting instrumental requirements for CHIME using simulations

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# WHY ARE SIMULATIONS IMPORTANT?

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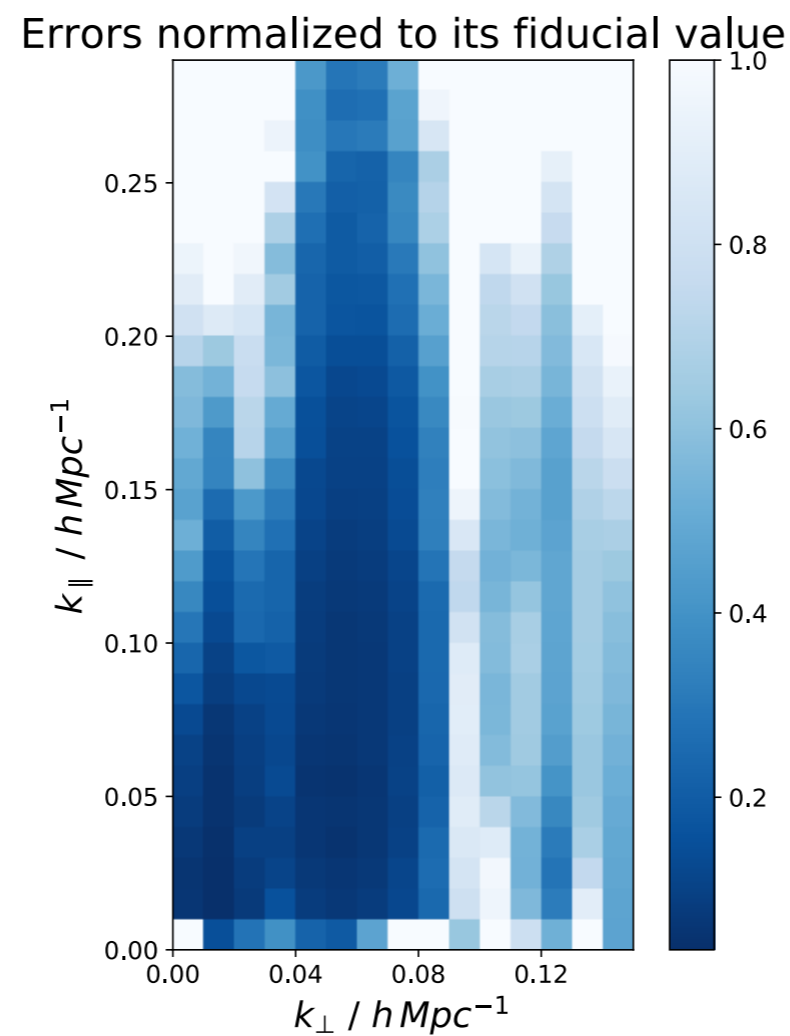
- Forecasting errors
  - Validating our analysis pipeline
  - Testing against systematics
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# ESTIMATING THE COVARIANCE OF THE POWER SPECTRUM

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Done by Monte Carlo sampling the covariance matrix - 400-500 MHz band

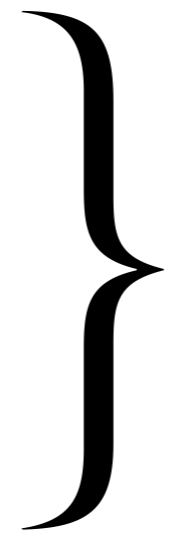


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# VALIDATING OUR ANALYSIS PIPELINE

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- Analysis pipeline
  - Processing of data
    - Map making
  - Foreground filtering
  - Power spectrum estimation



All these require a model of the primary beam

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# A BASIC SIMULATION PIPELINE

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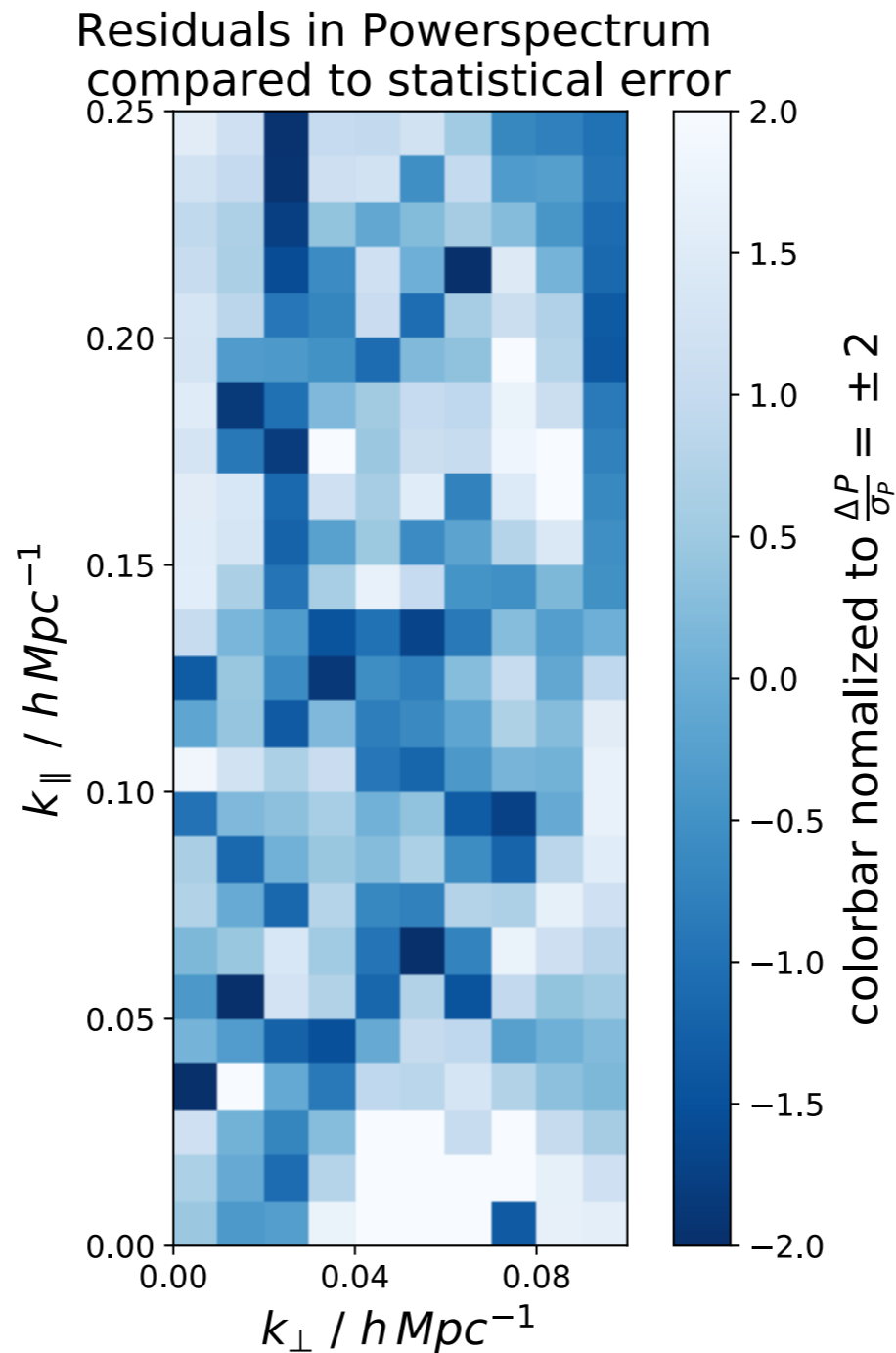
- Simulate fake maps including the galactic emission, 21 cm signal and point source
  - Simulate time stream data
  - Simulate thermal noise
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# VALIDATING OUR ANALYSIS PIPELINE

## POWER SPECTRUM ESTIMATION

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# TESTING AGAINST SYSTEMATICS

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Let's mess with the data!

- **Calibration errors**
- **Incorrect beam models**
- **Radio frequency interference**
- **Cross talk**
- **Incorrect receiver temperature**

All of these are unknown to the foreground filter!

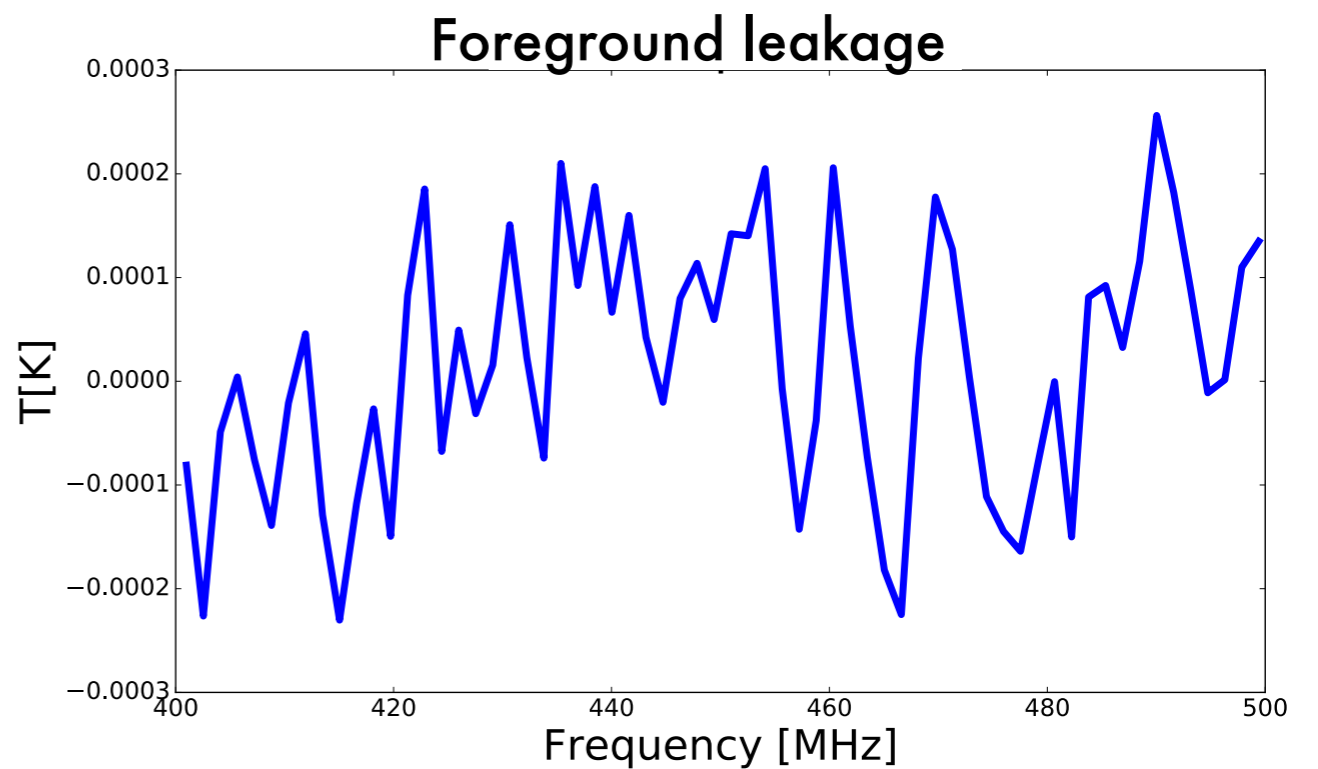
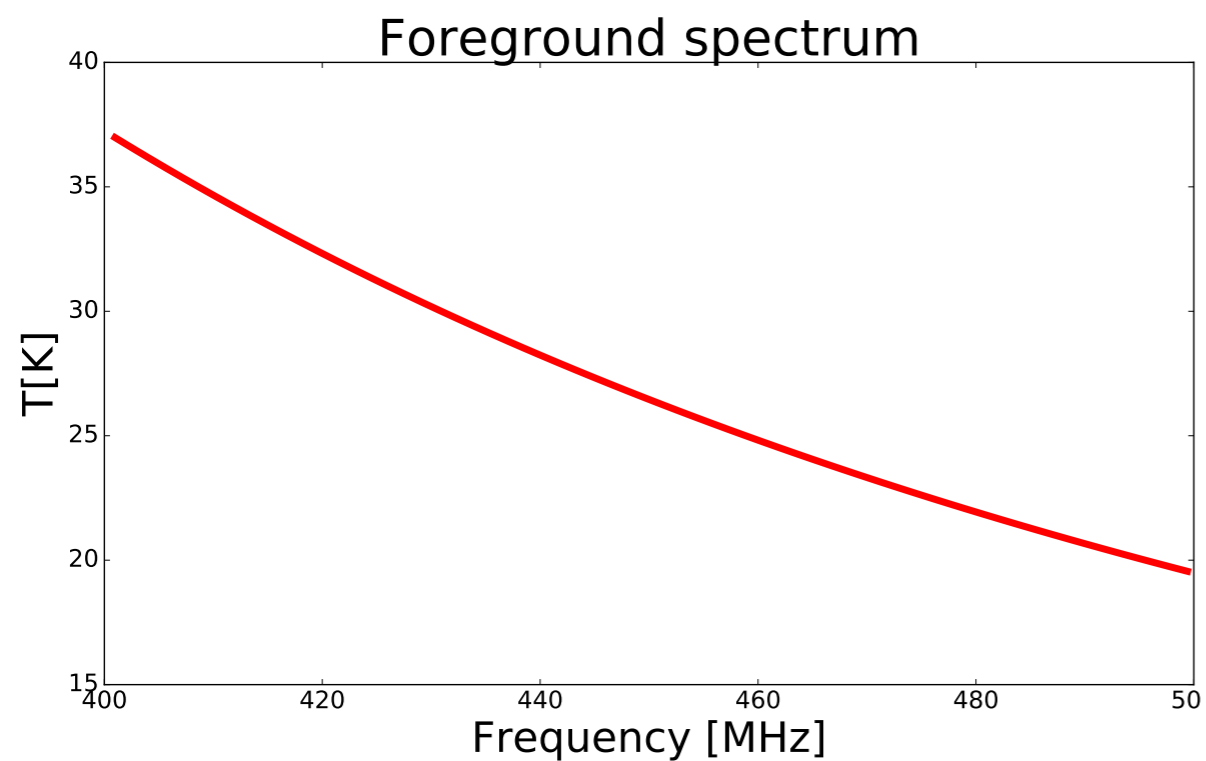
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# TESTING AGAINST SYSTEMATICS

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... this will cause foreground leak into the power spectrum





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# TESTING AGAINST SYSTEMATICS

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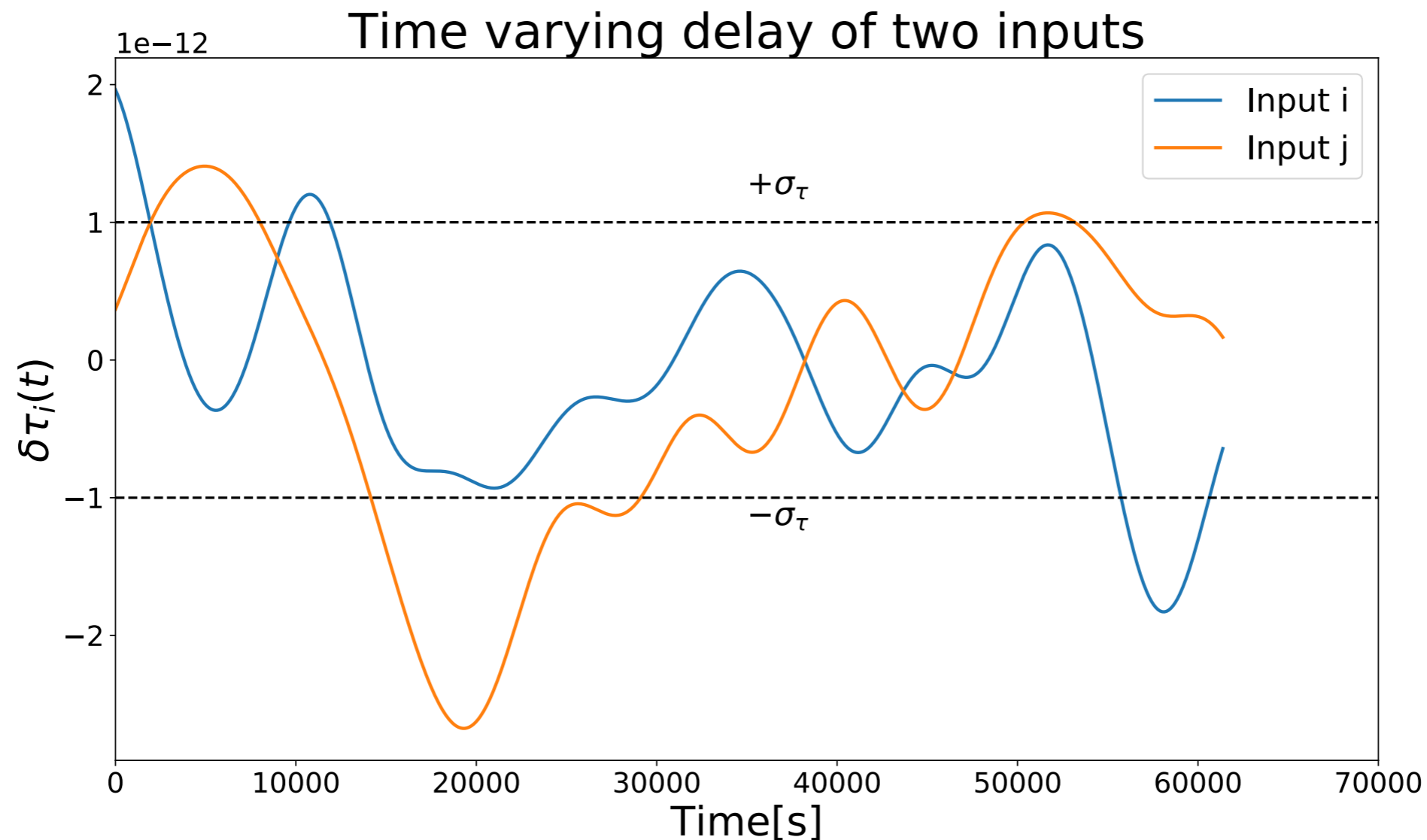
- A basic simulation pipeline
  - Simulate fake maps including the galactic emission, 21 cm signal and point source
  - Simulate time stream data using beam transfer functions
  - Simulate thermal noise

→ **Inject crappiness here**

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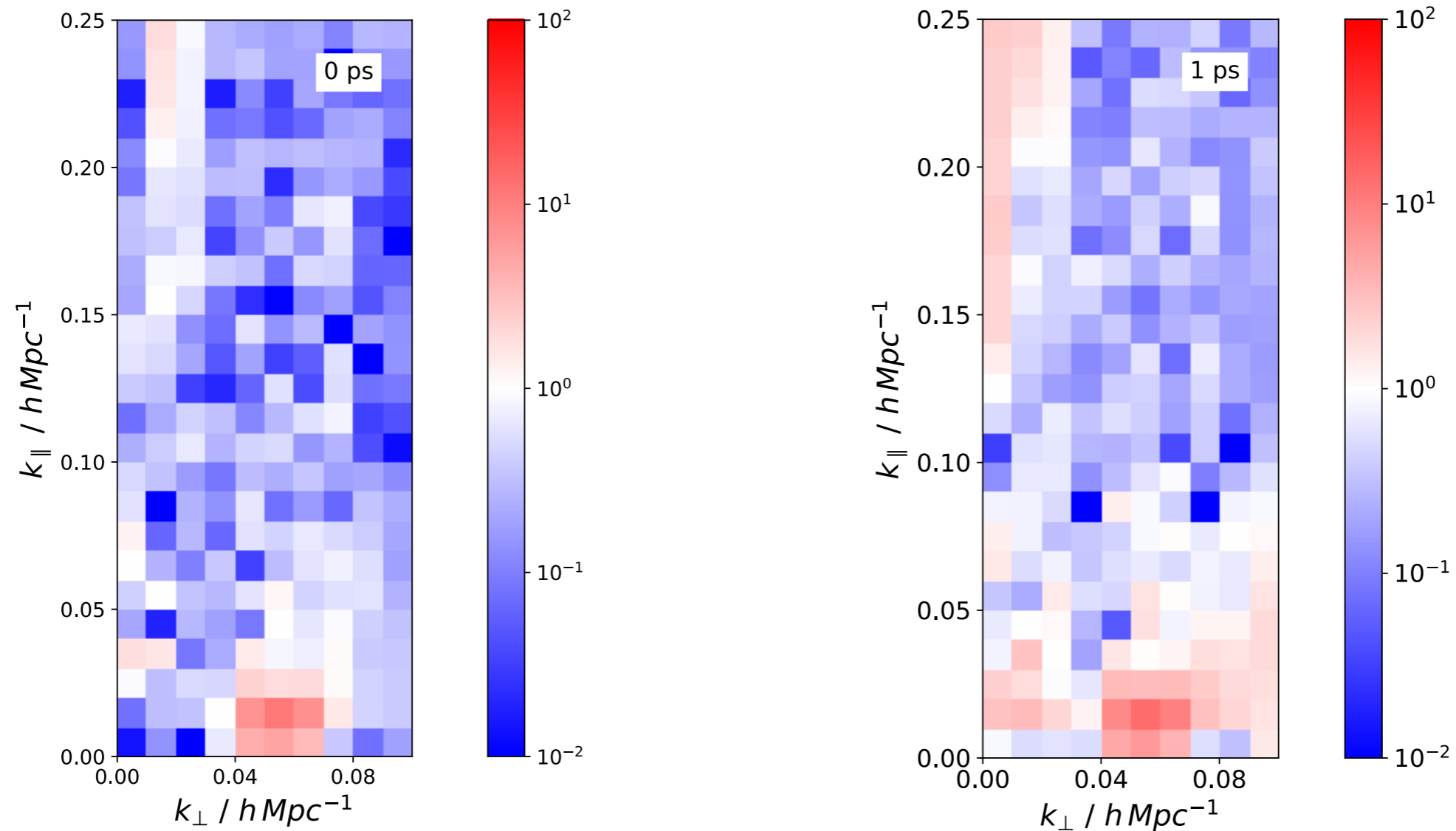
# TESTING AGAINST SYSTEMATICS

- Example: calibration errors - (tell the GPS clock story!)



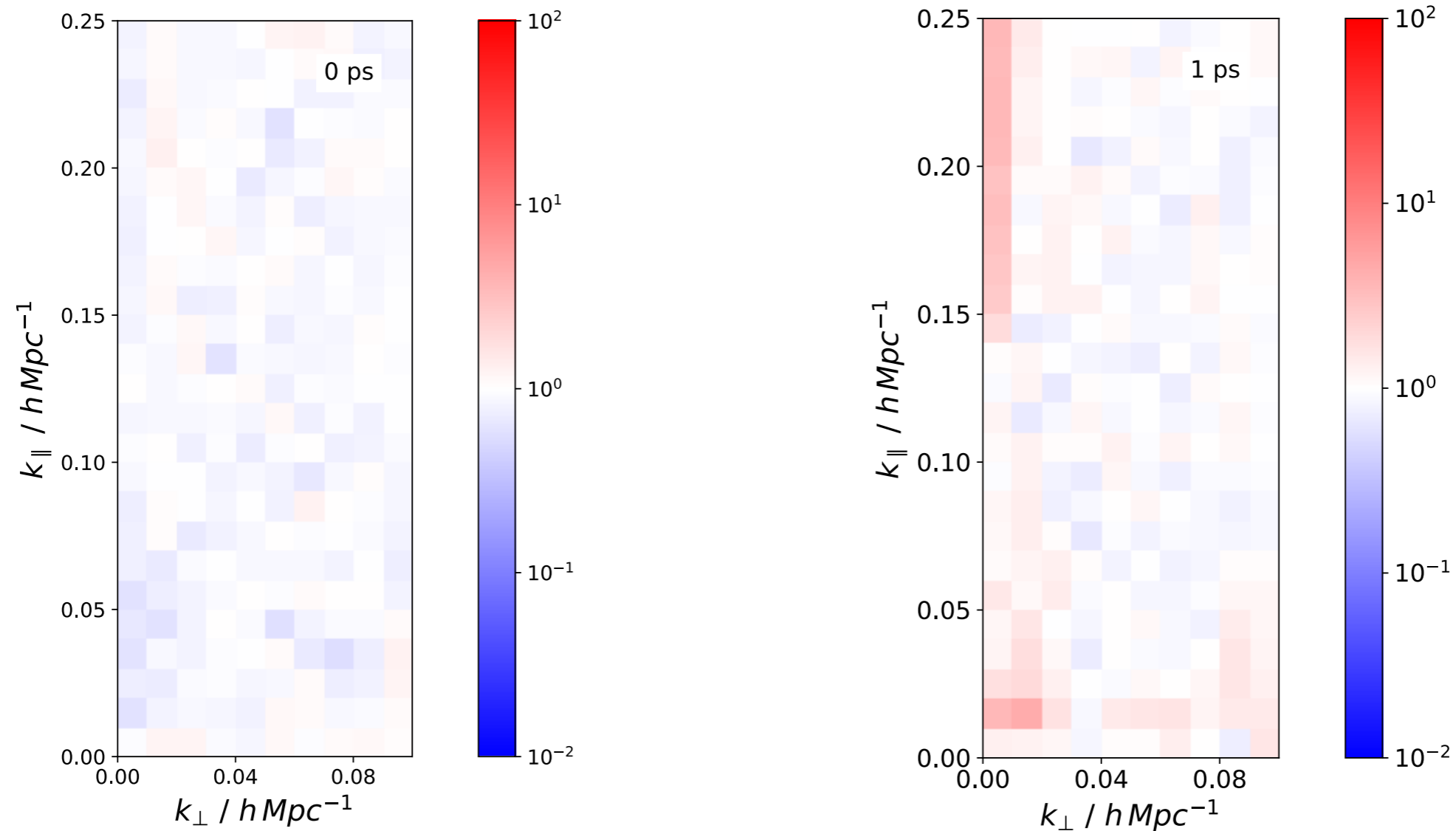
# TESTING AGAINST SYSTEMATICS

- push through analysis pipeline and look for bias



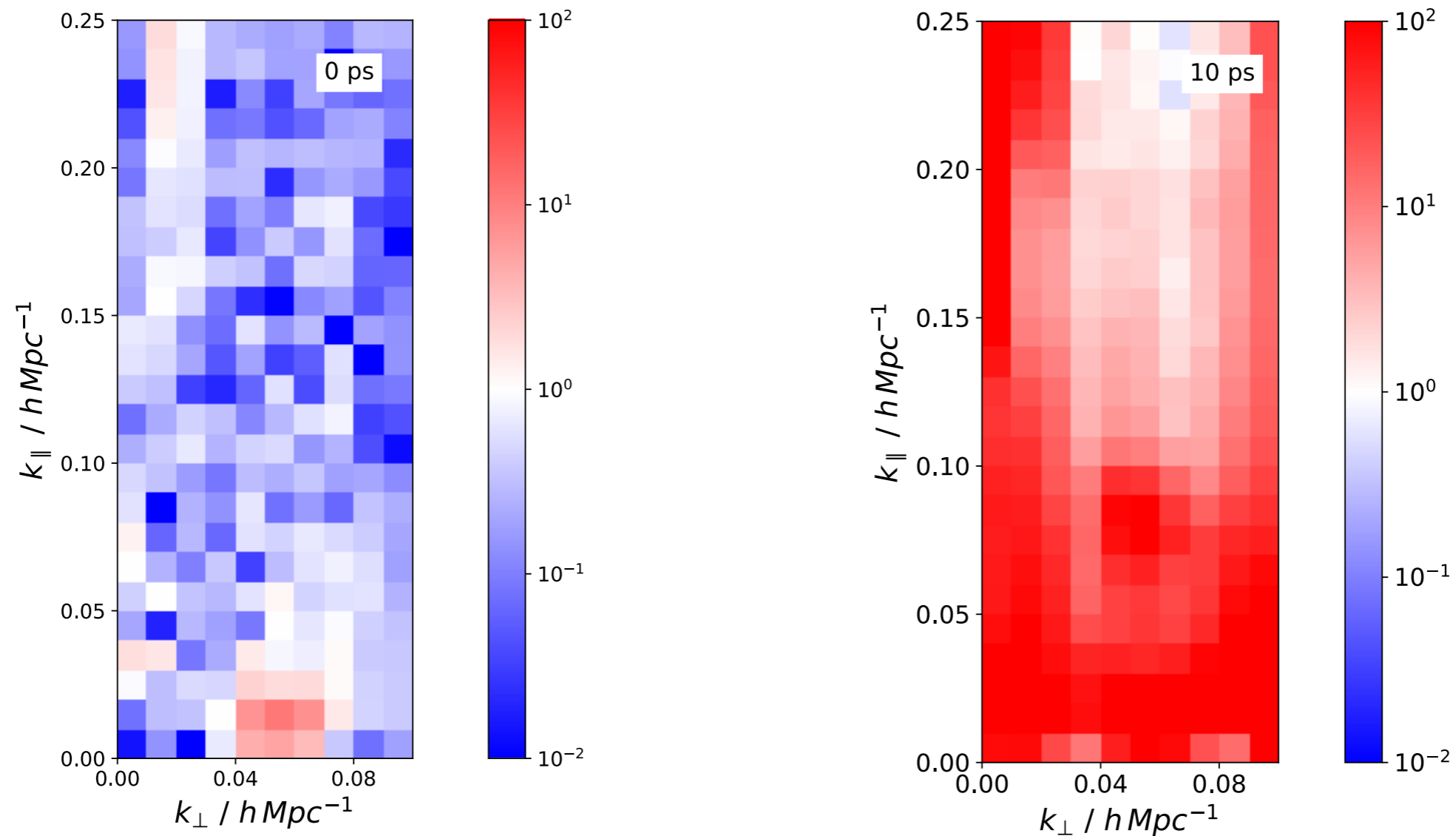
# TESTING AGAINST SYSTEMATICS

- push through analysis pipeline and look for extra variance



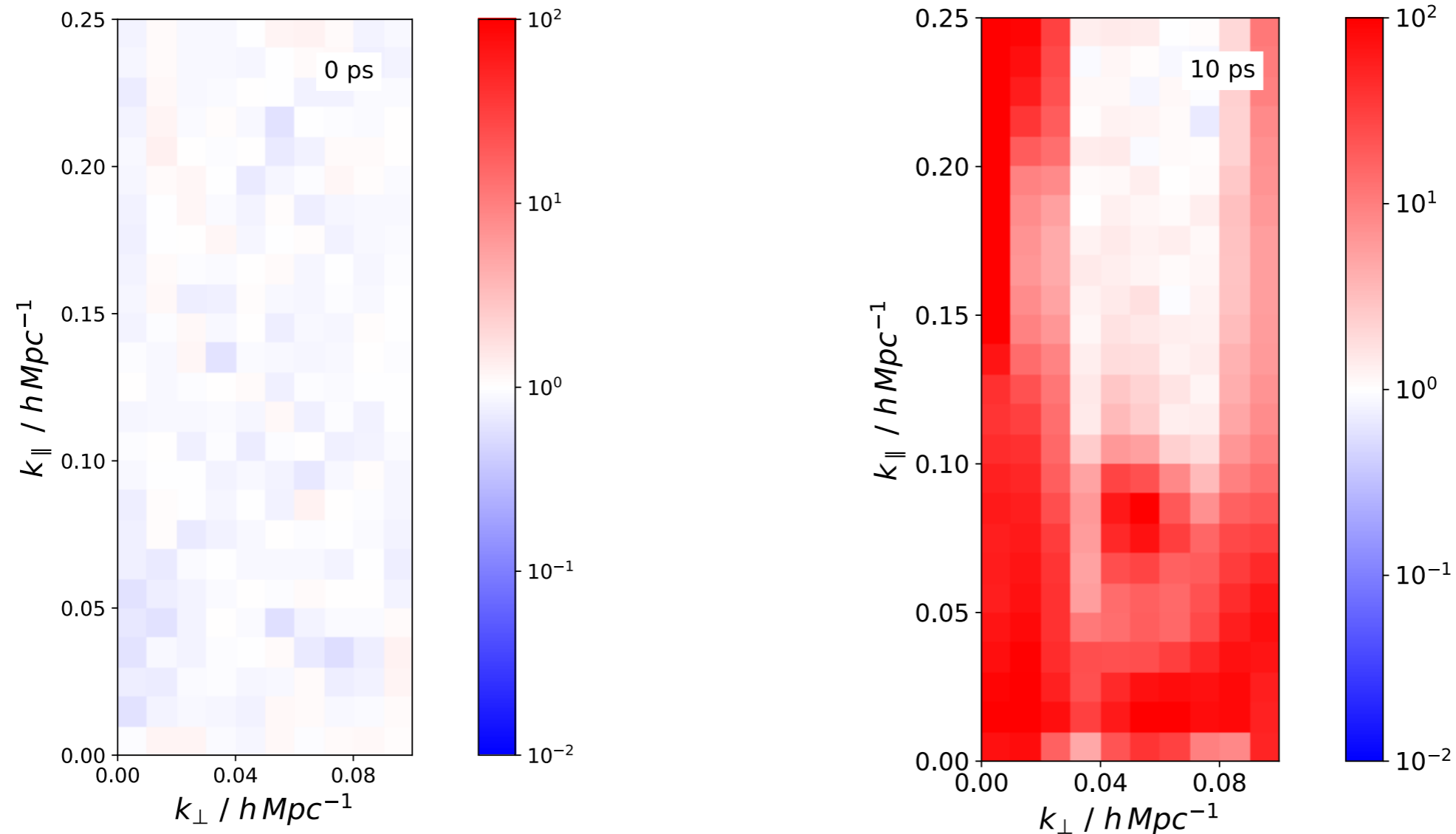
# TESTING AGAINST SYSTEMATICS

- push through analysis pipeline and look for bias



# TESTING AGAINST SYSTEMATICS

- push through analysis pipeline and look for extra variance



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# ...BEHIND THE SCENES...

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