25th EVGA Working Meeting, March 15-18 2021, Cyberspace

VLBI Intensive sessions: the selection of baselines for UT1 estimation

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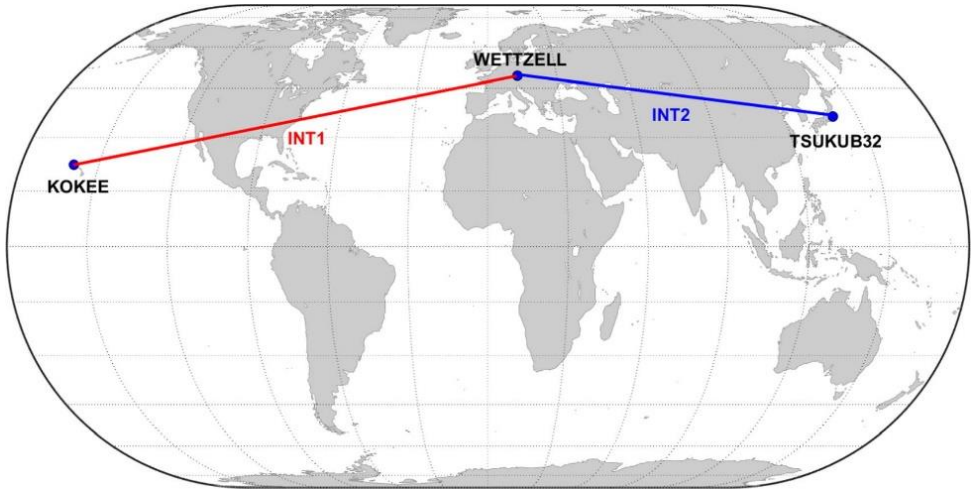
VLBI Intensive sessions

- **1 hour single baseline sessions dedicated to derive UT1-UTC**
- most commonly observed baselines from [2019;2021]*:

- identifying the **optimal VLBI baseline geometry**



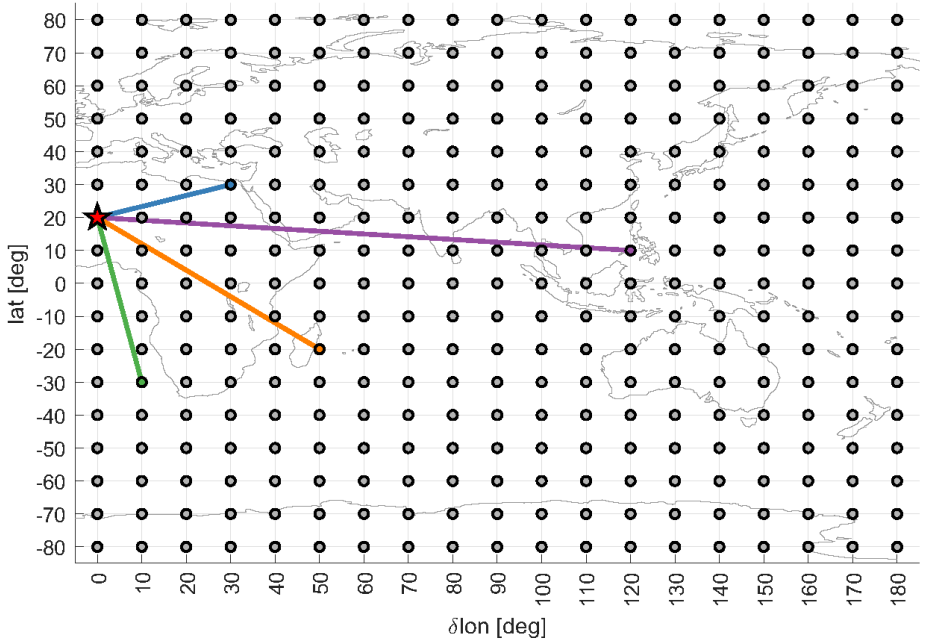
Landskron and Böhm (2019)

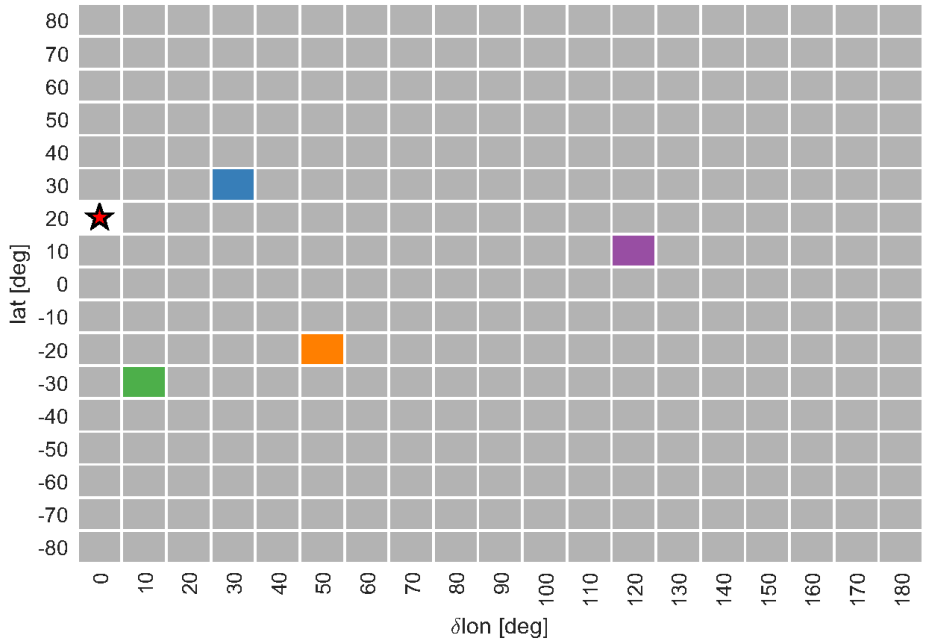
baseline	count
Kk – Wz	899
Wz – Is	367
Mk – Wz	251
Ny – Wz	203
Pt – Wz	144
Mk – Pt	111
Wz - Sh	107
Ny – Is	103

* https://ivscc.gsfc.nasa.gov/sessions/

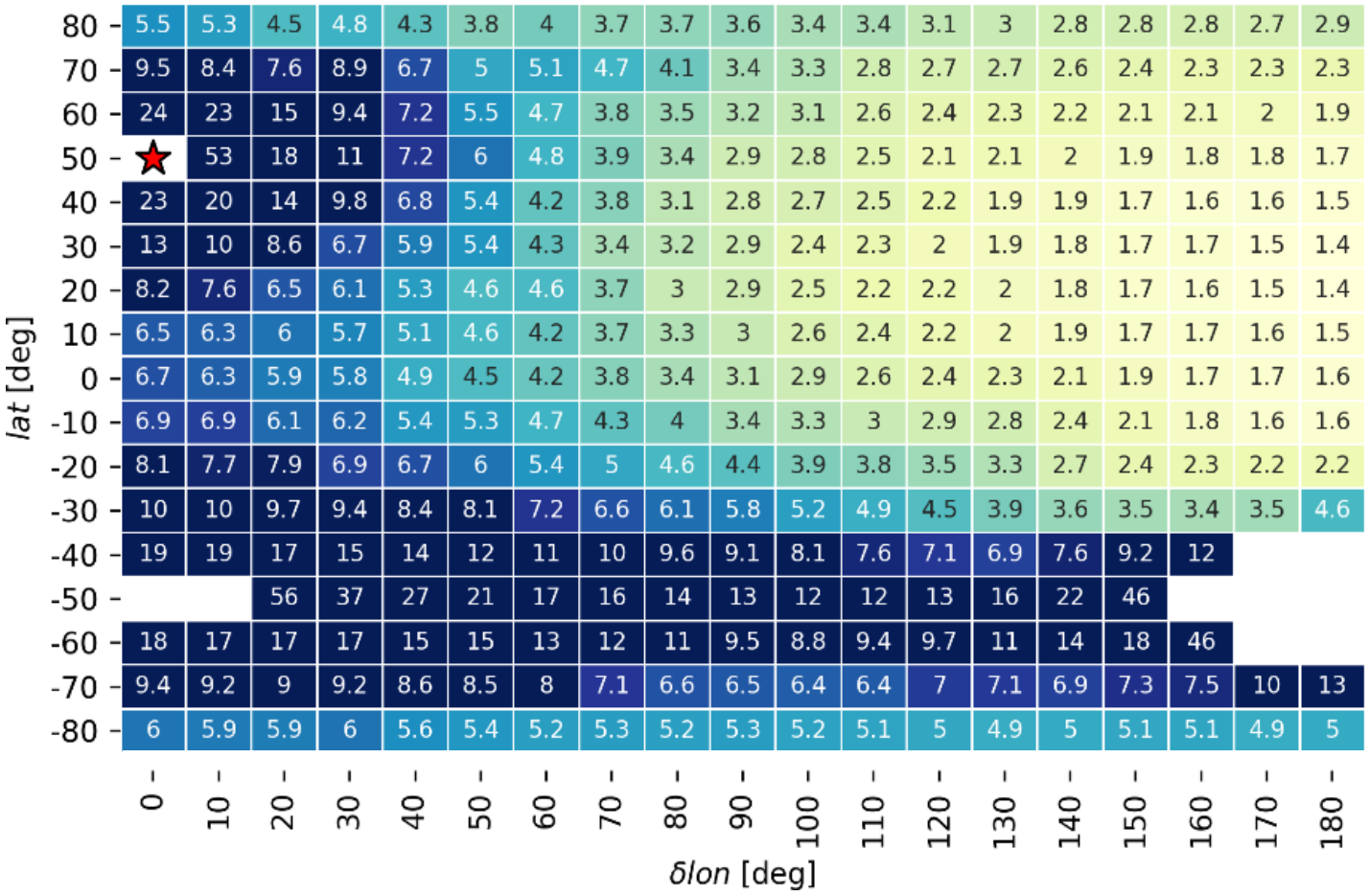
Experiment setup

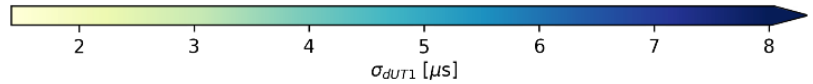
- **10° x 10° global grid**
- **scheduling and simulation:**
  - 2898 baselines
  - monthly 1h-long sessions over 1 year with a fixed start time
  - **focus corner observations** *(Uunila et al., 2012) (Baver and Gipson, 2015)*





Optimal VLBI baseline geometry





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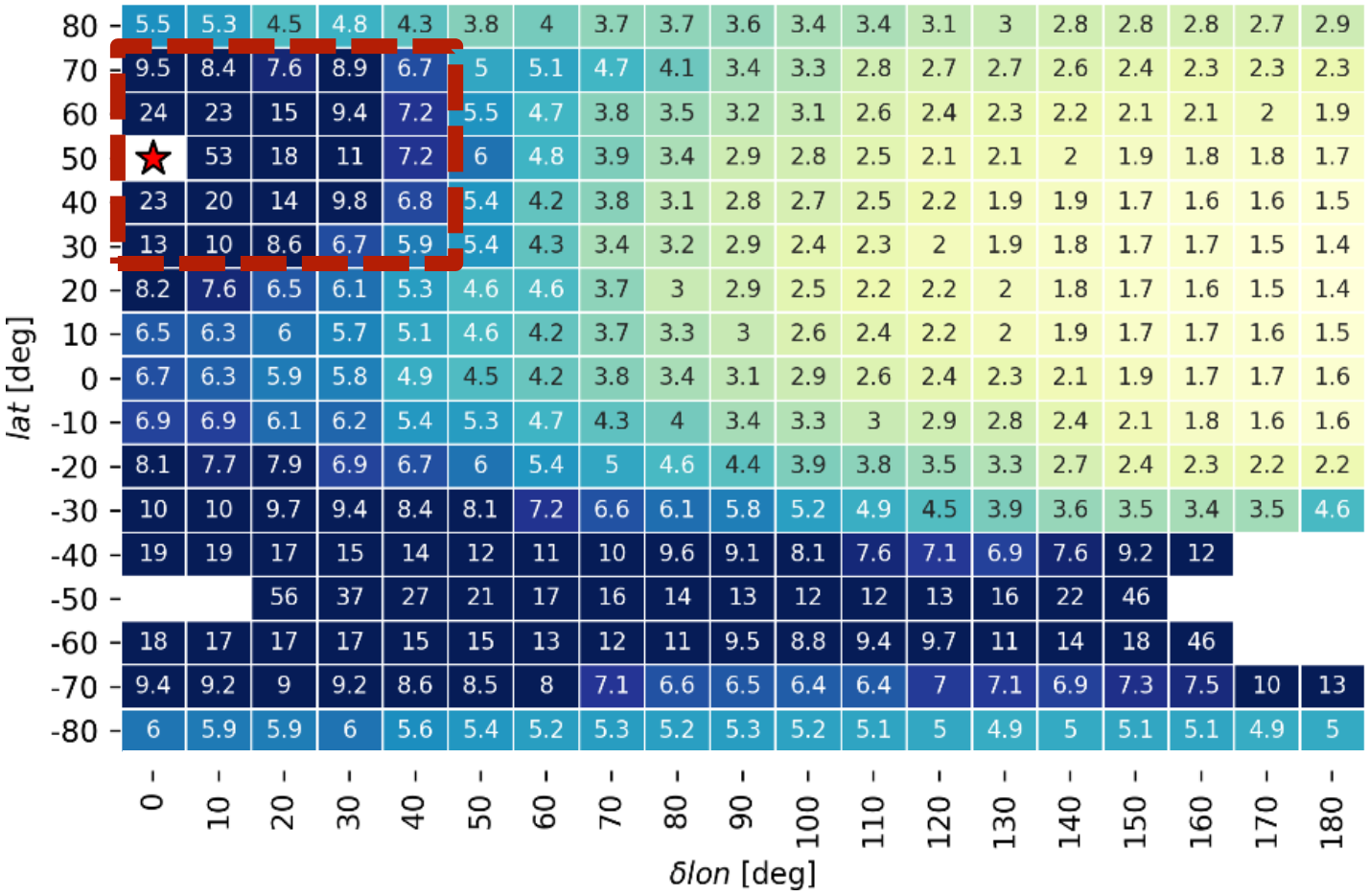
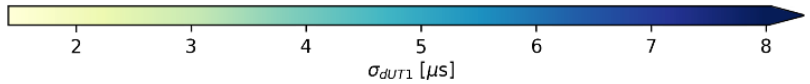


- high $\bar{\sigma}_{dUT1}$
  - short baselines
  - very long baselines
  - baseline orientation parallel to Earth rotation vector/ mid-point close to equator $lat1 + lat2 \approx 0$



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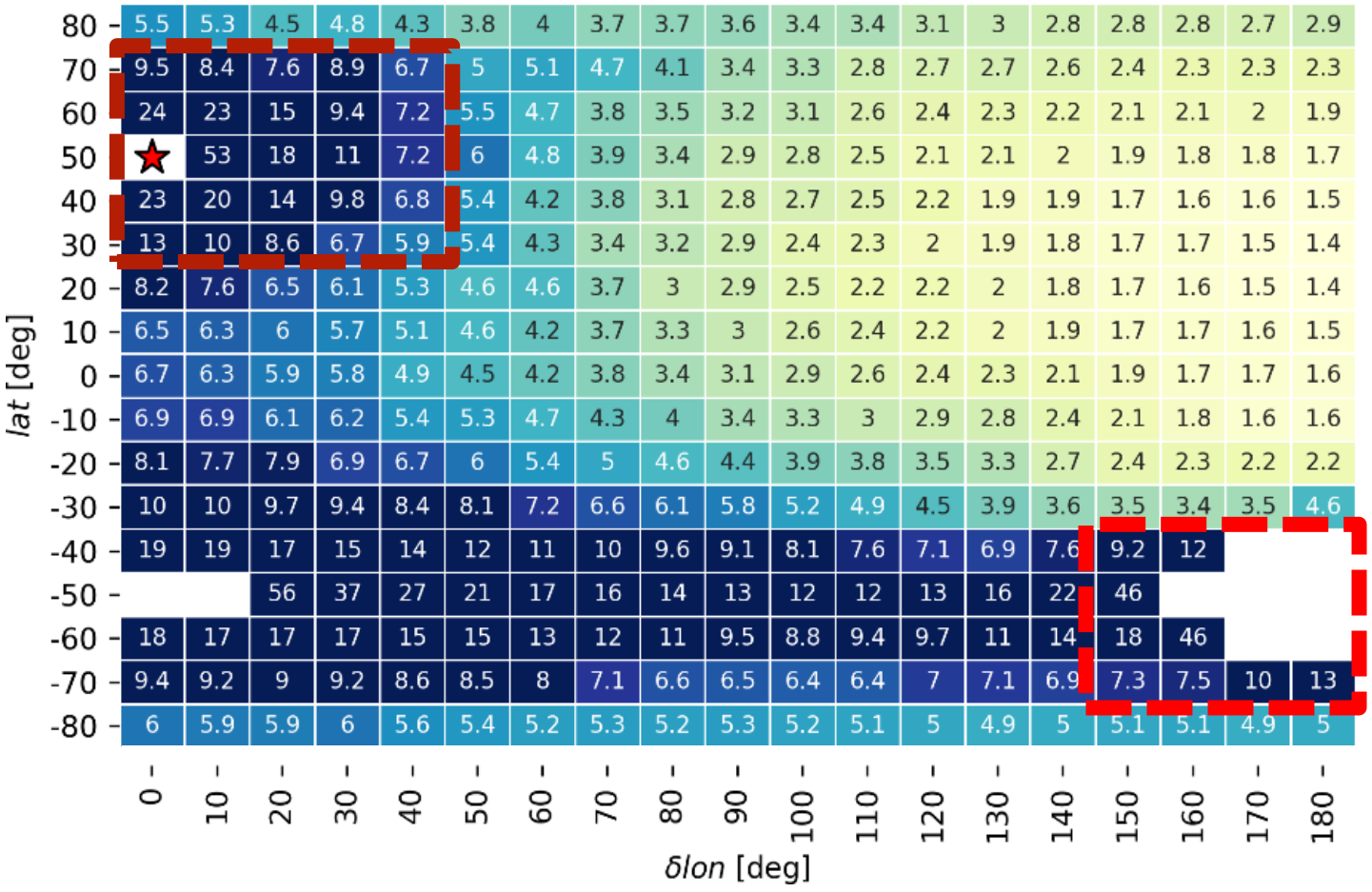

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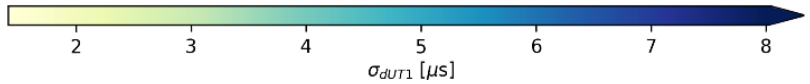

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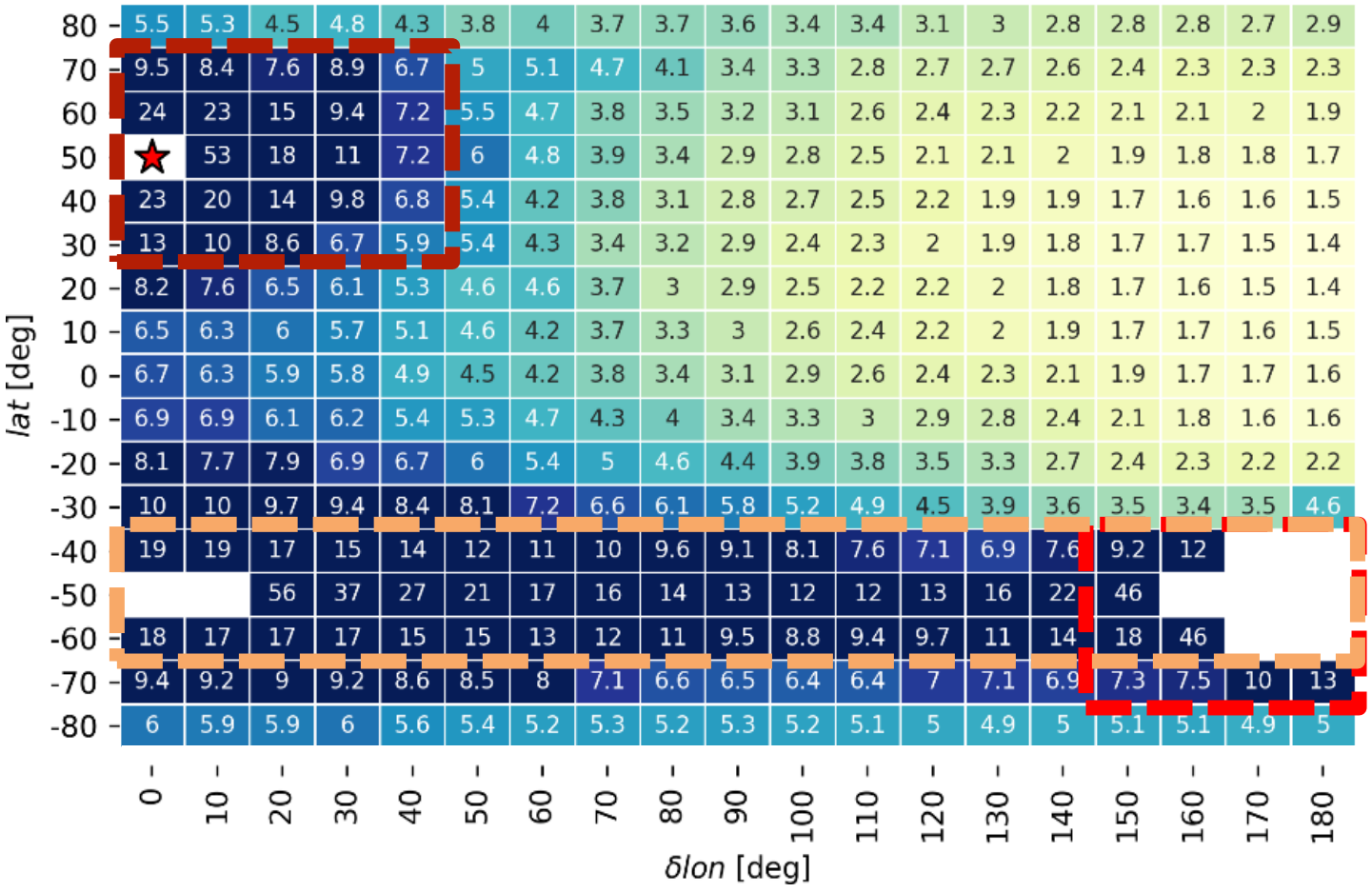

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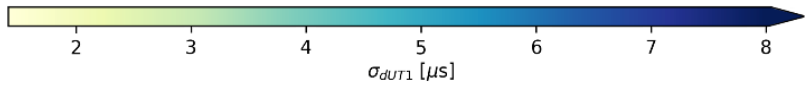

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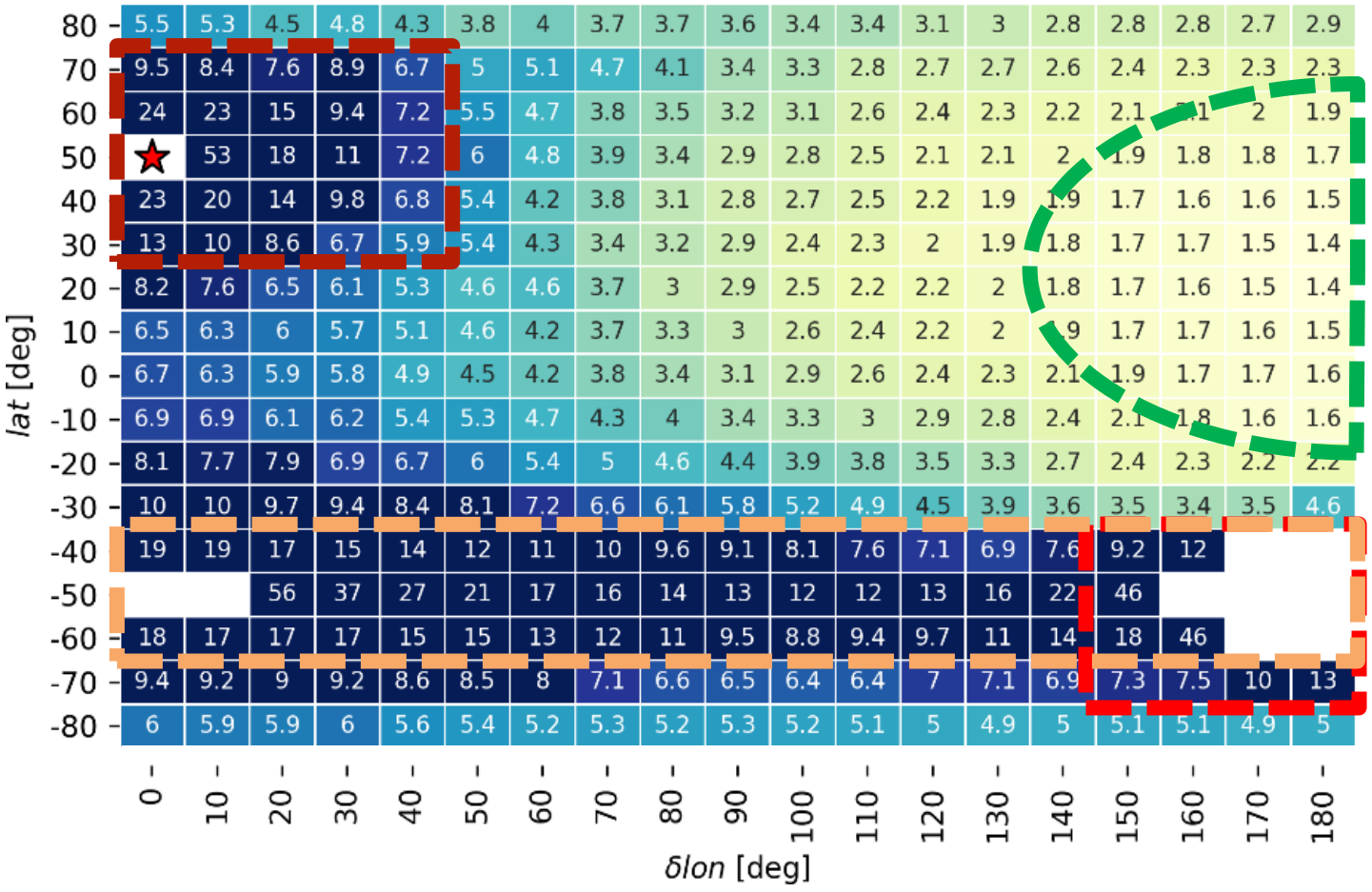
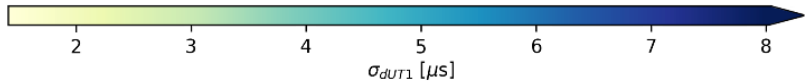


- high $\bar{\sigma}_{dUT1}$
  - short baselines
  - very long baselines
  - baseline orientation parallel to Earth rotation vector/ mid-point close to equator $lat1 + lat2 \approx 0$
- optimal baselines
  - high-to-mid-lat and low-to-mid-lat baselines and large δlon



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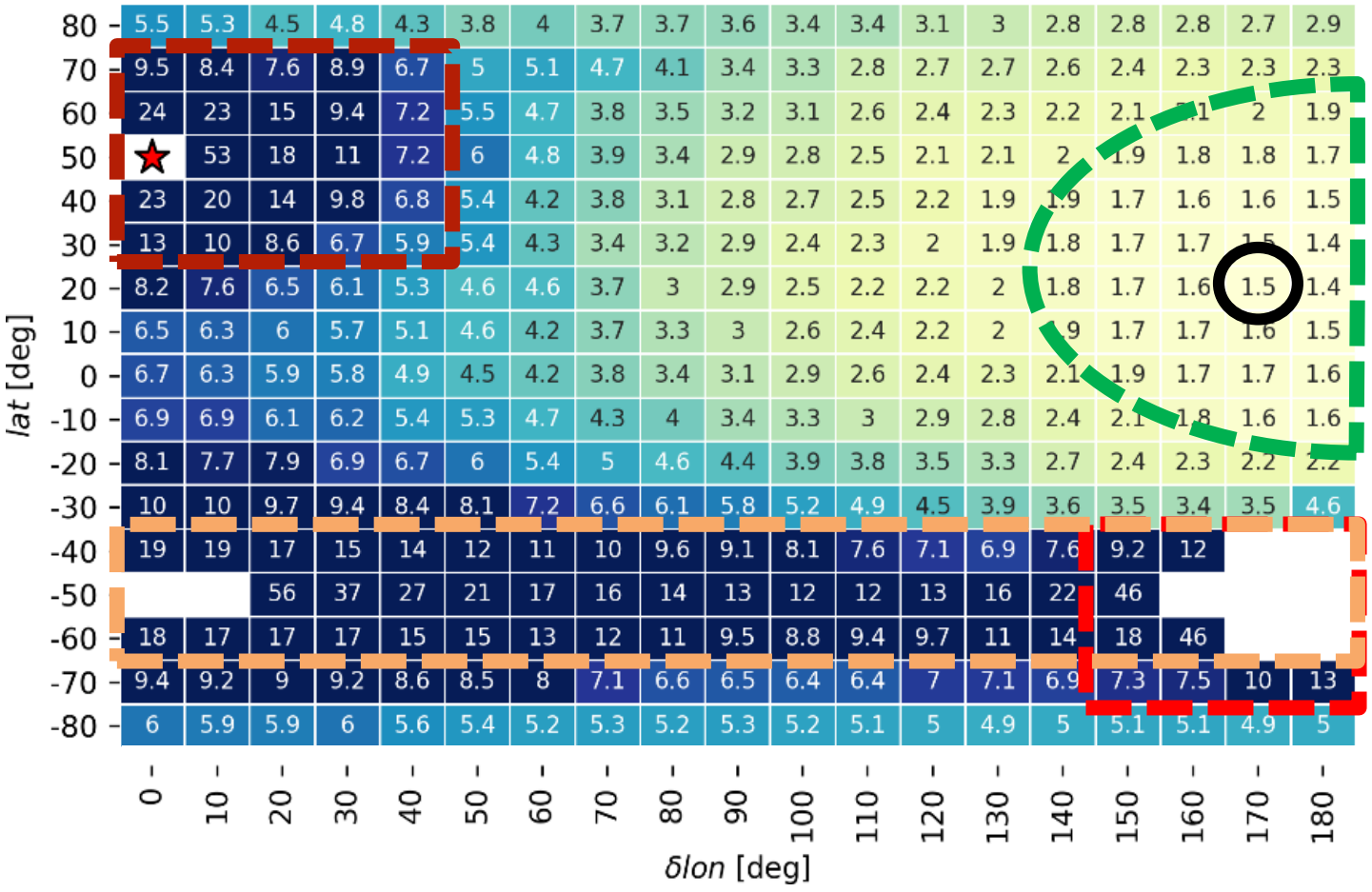
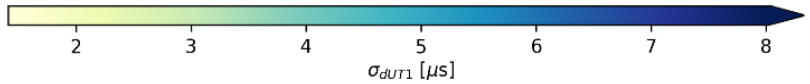


Wz

Kk



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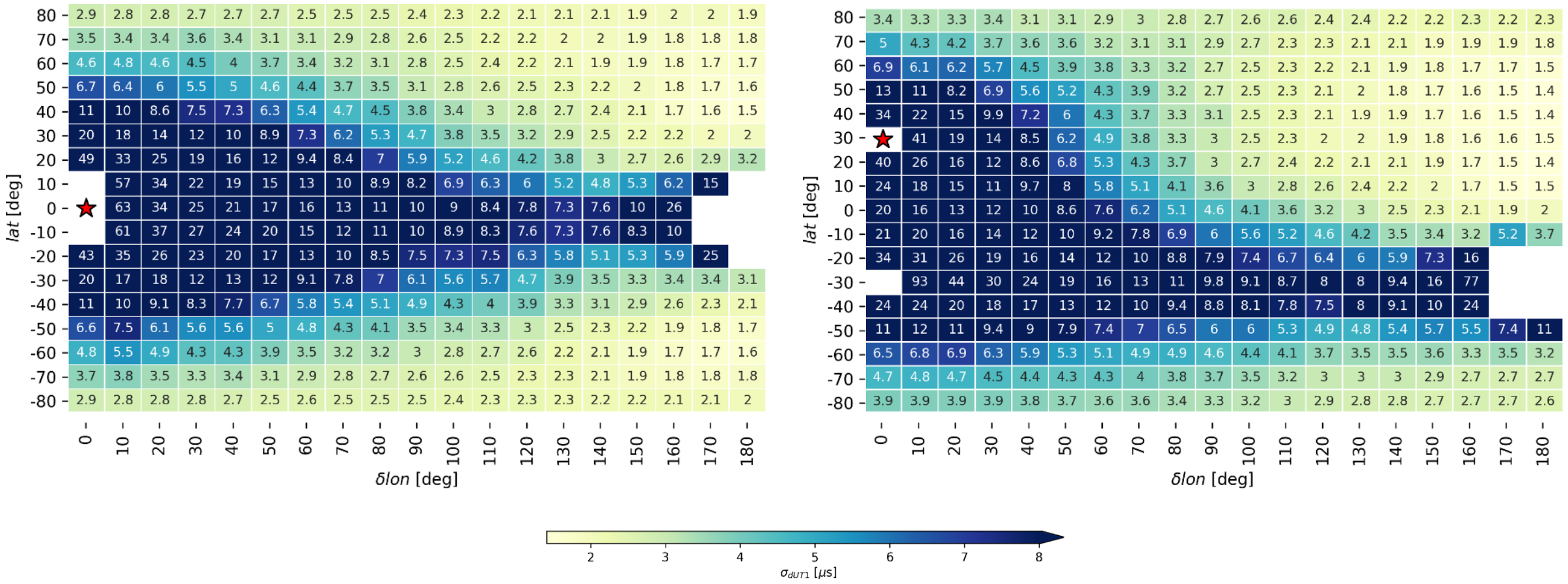

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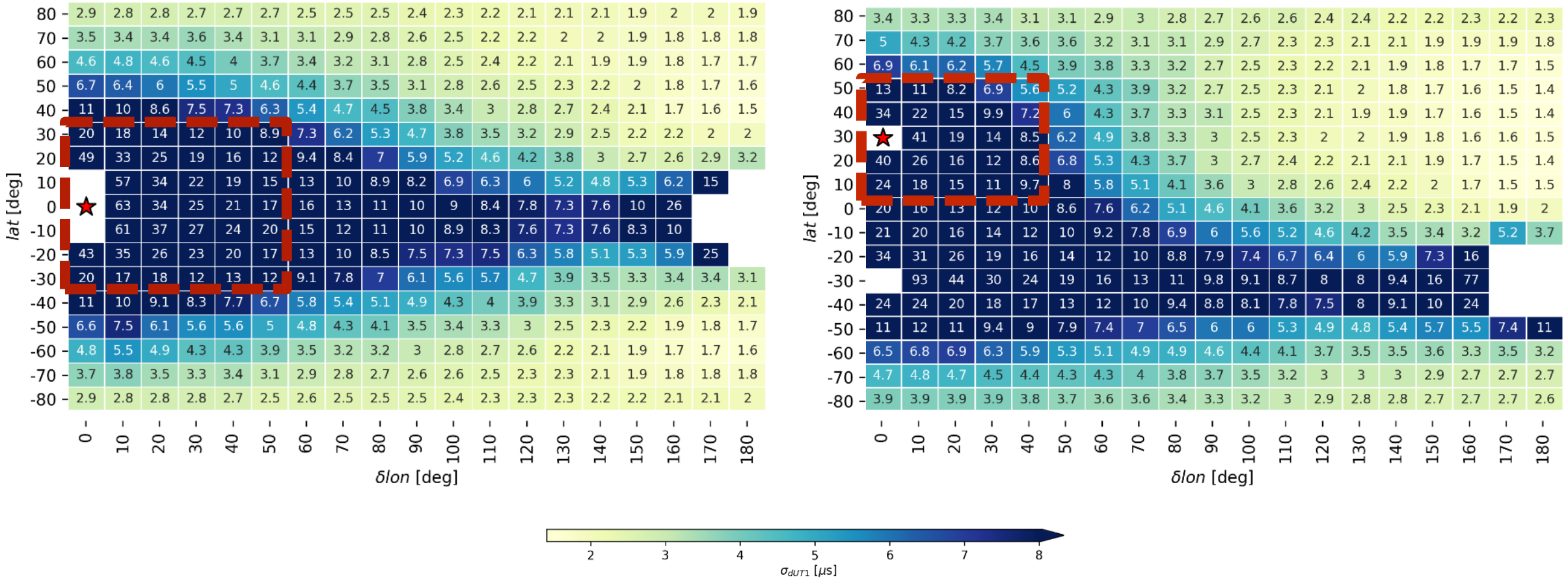

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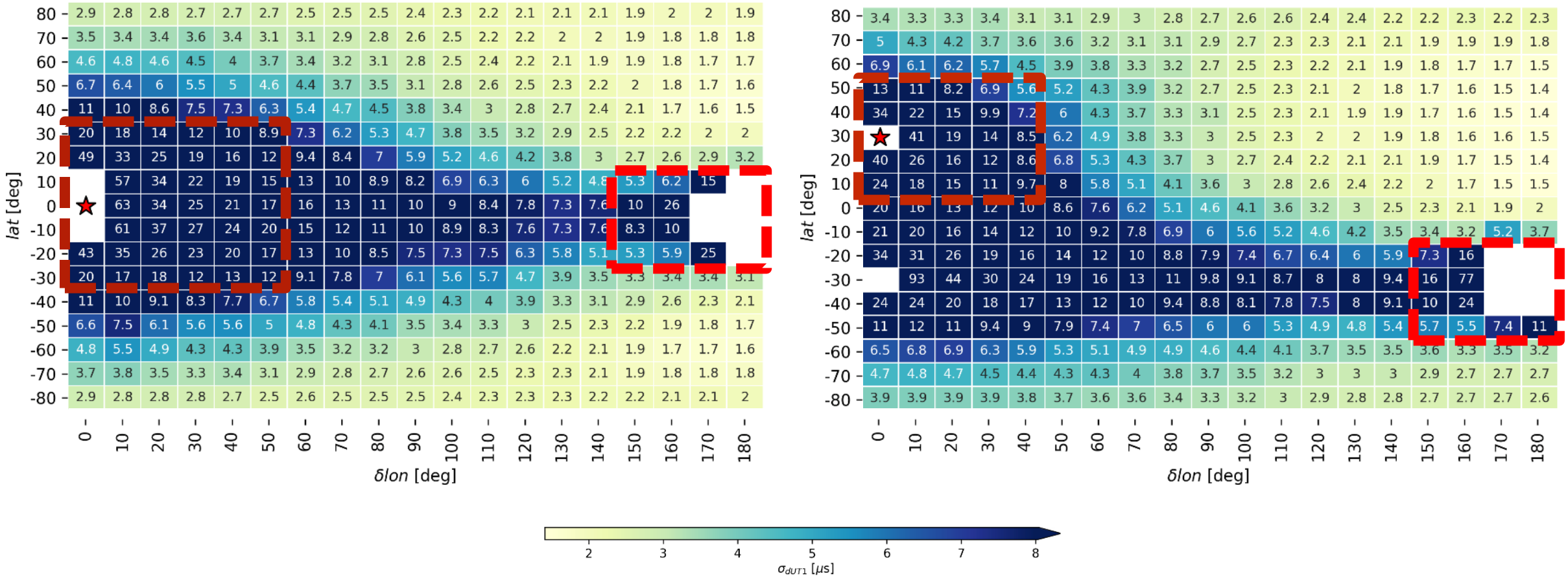

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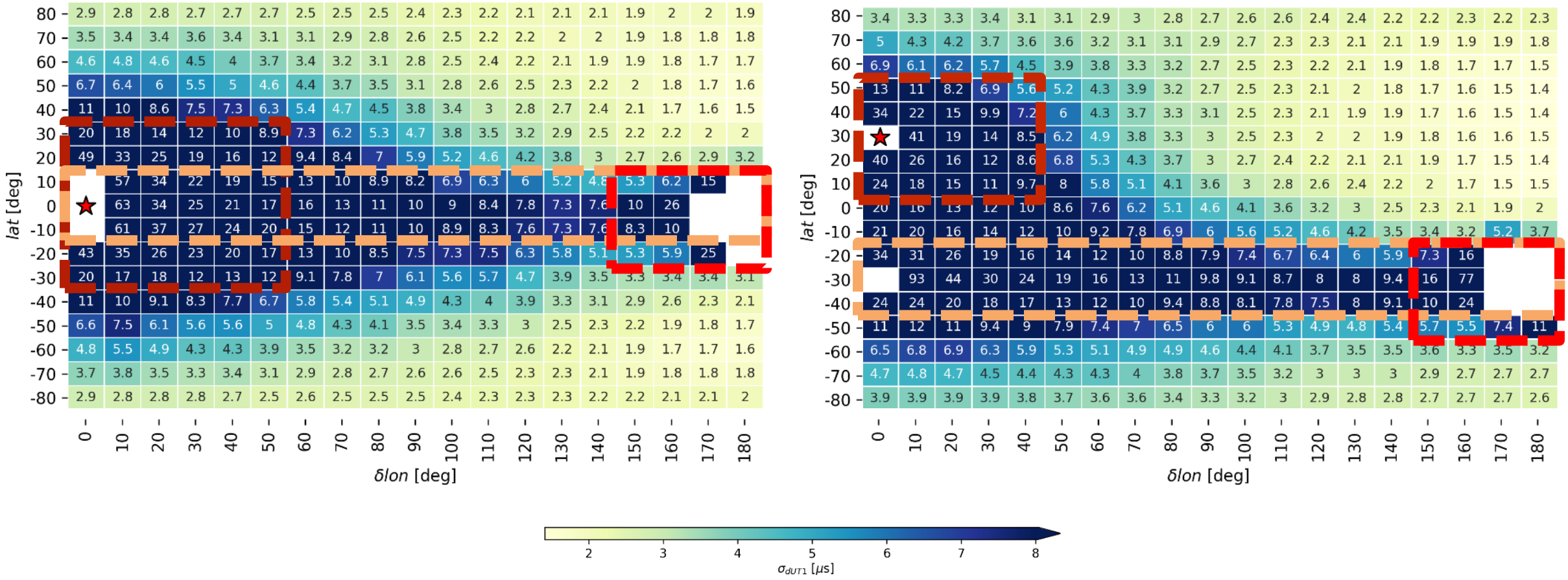

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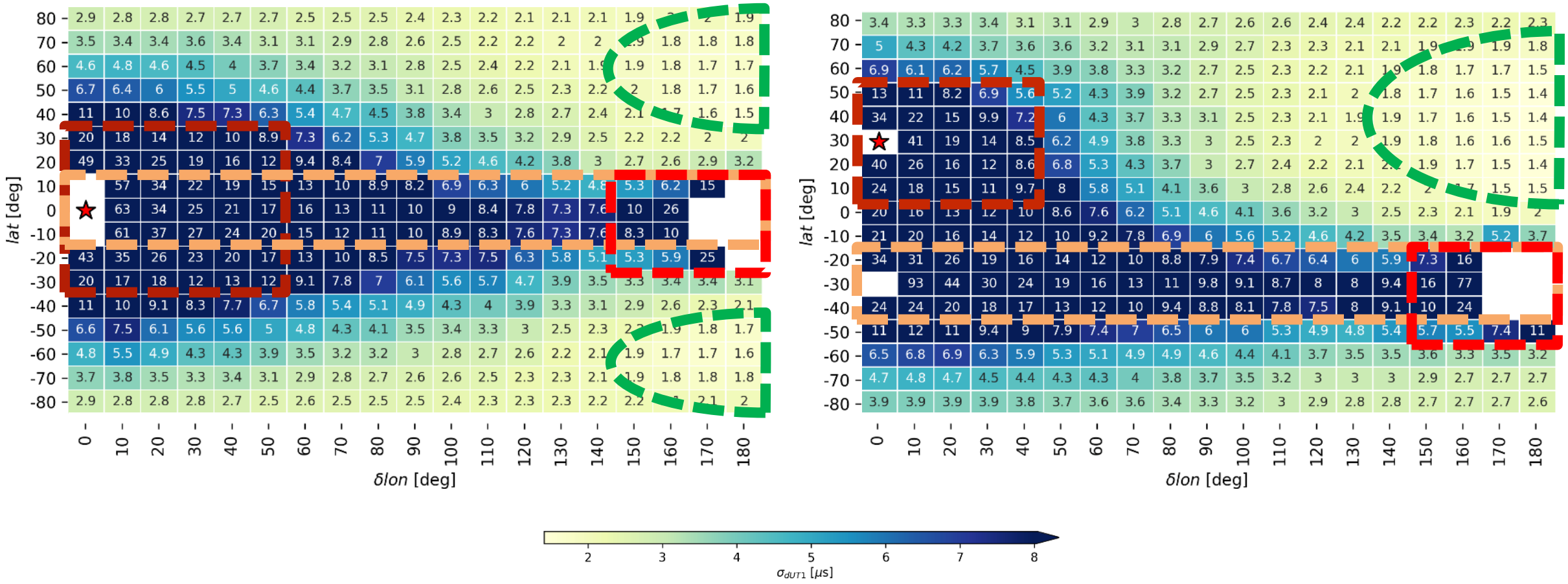

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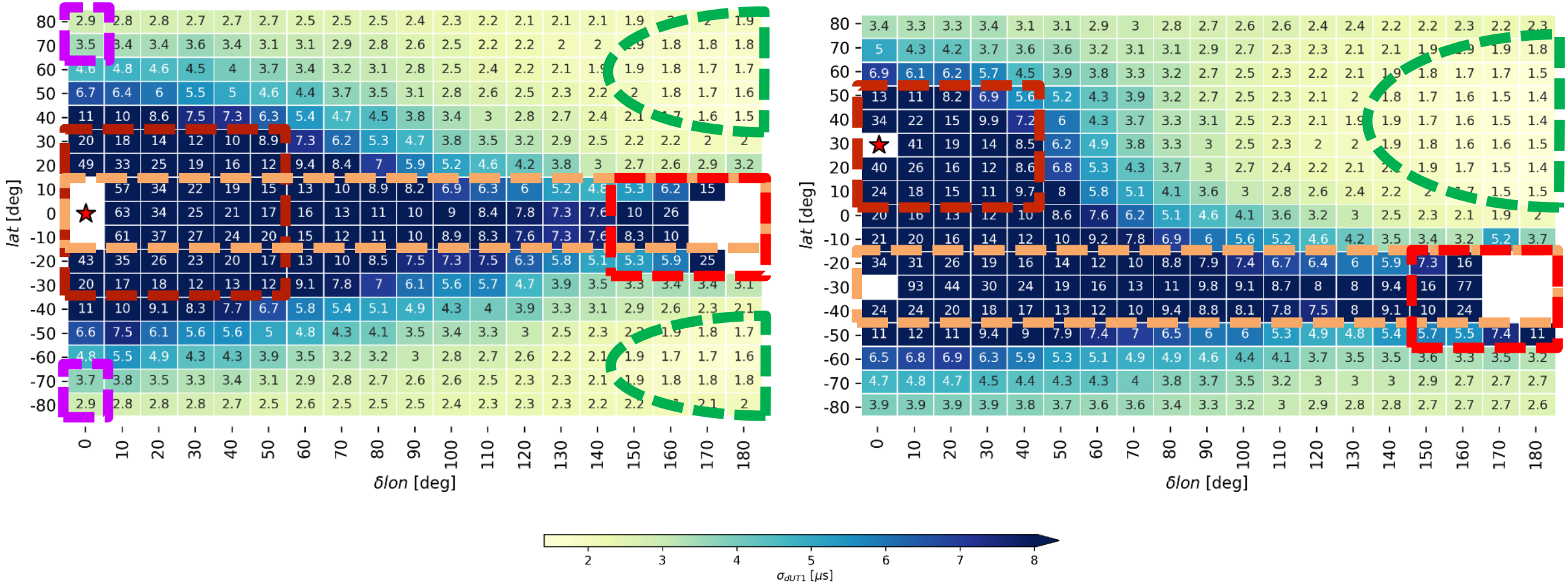

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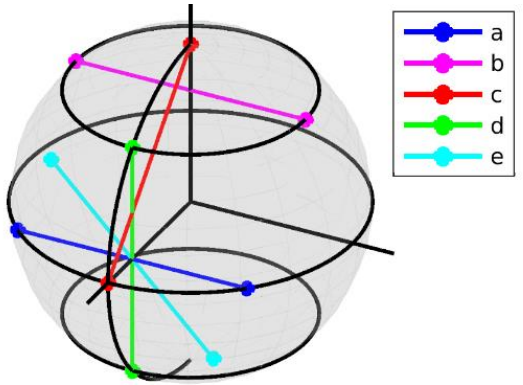
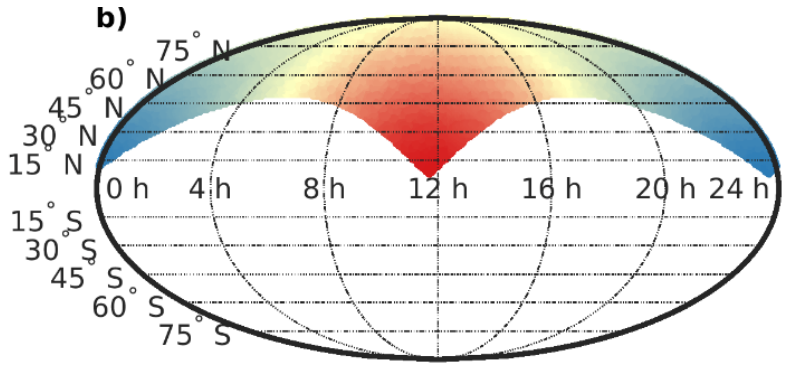
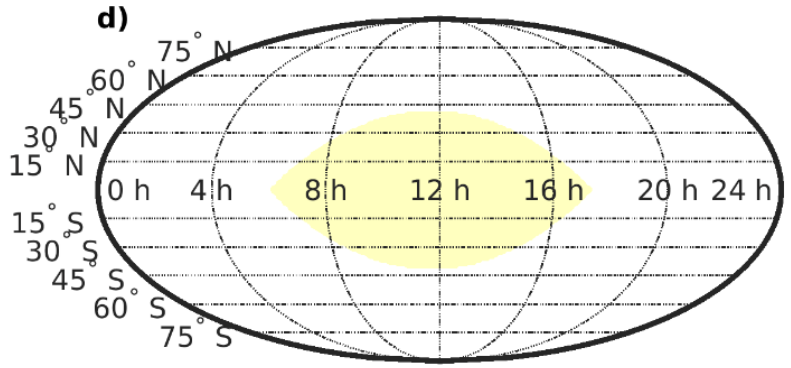
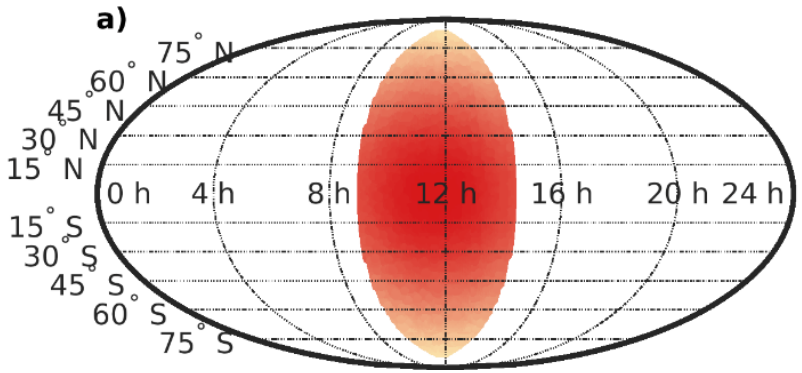
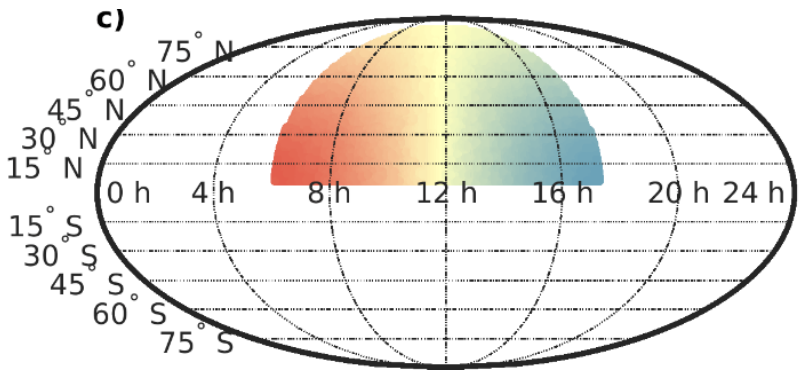
Partial derivative

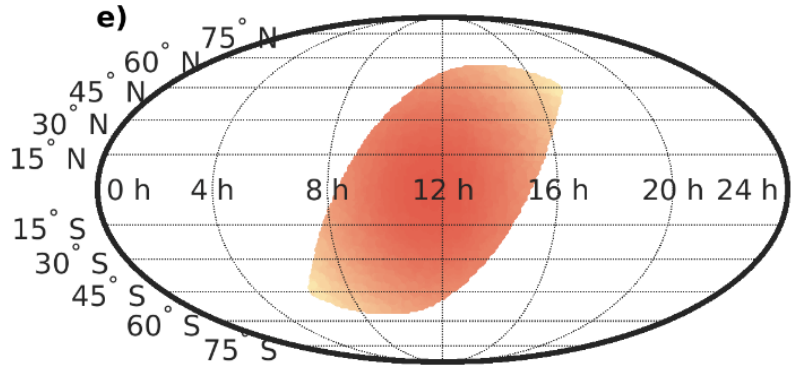


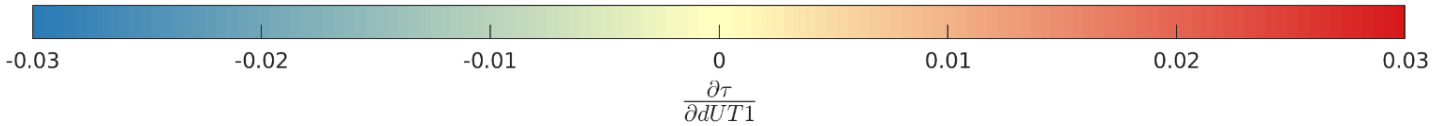






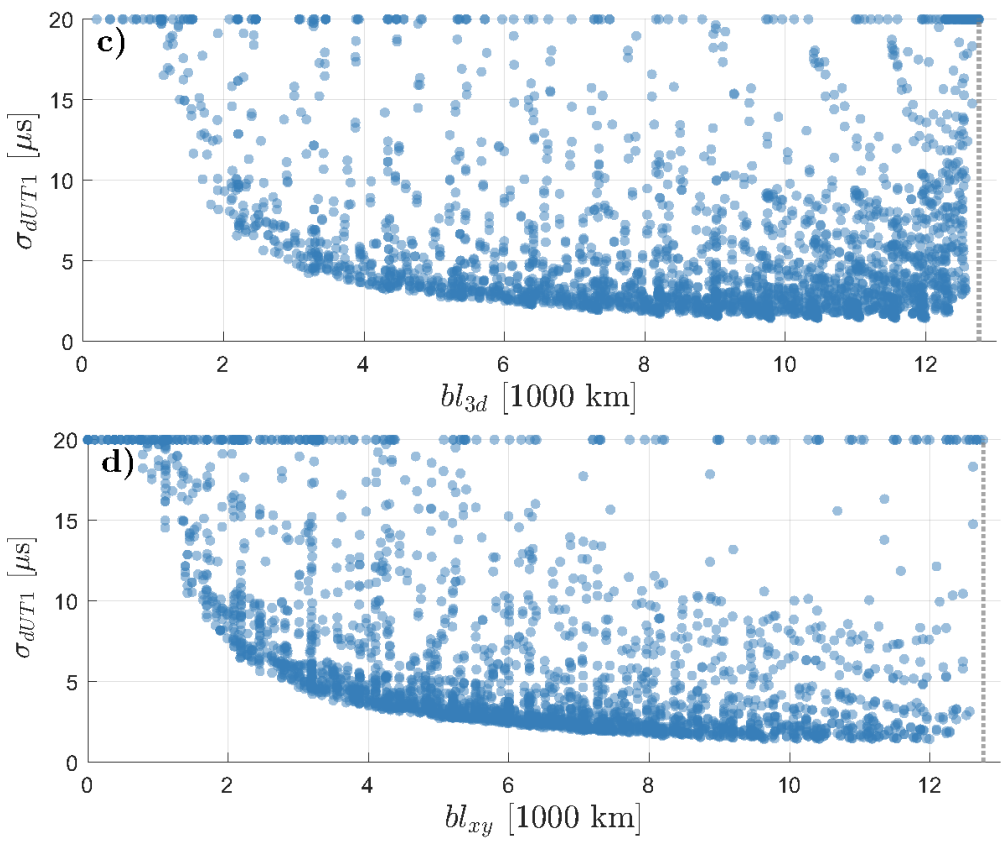


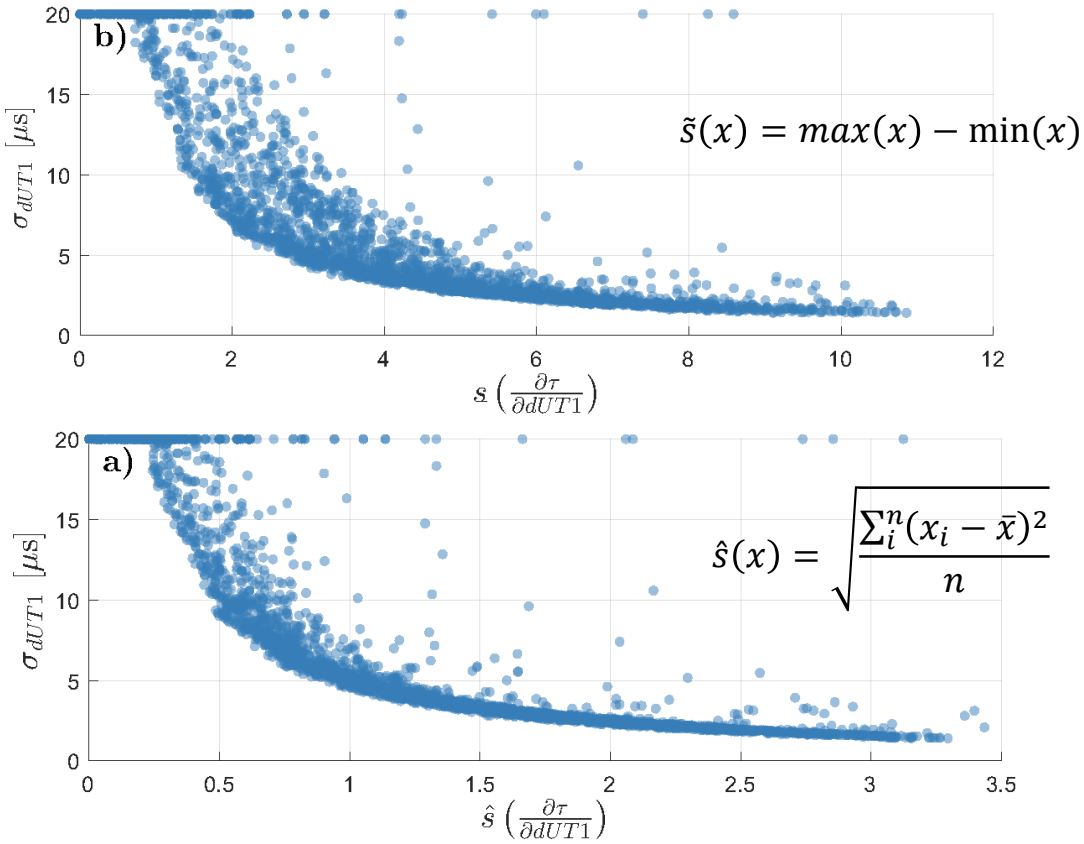




Intensive baseline quality metrics

- distribution of σ_{dUT1} w.r.t.:
  - baseline length
  - variability of $\frac{\partial \tau}{\partial dUT1}$





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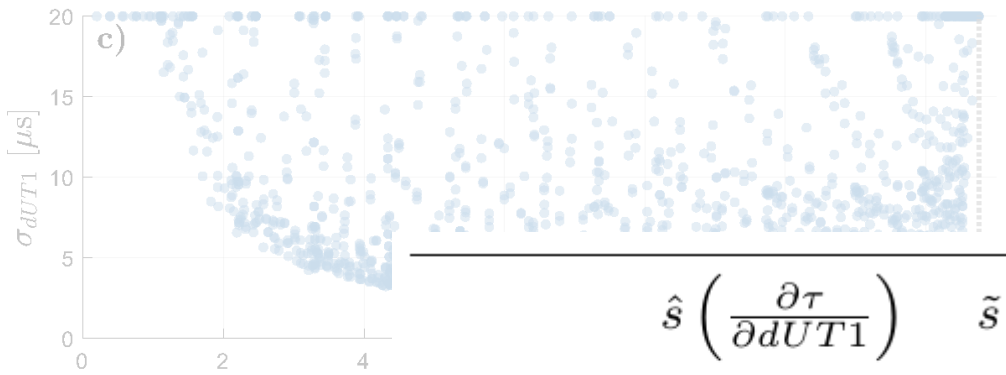
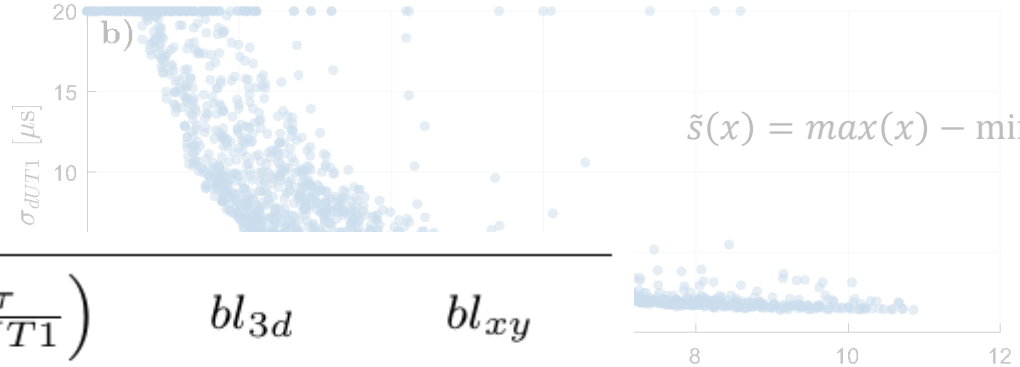
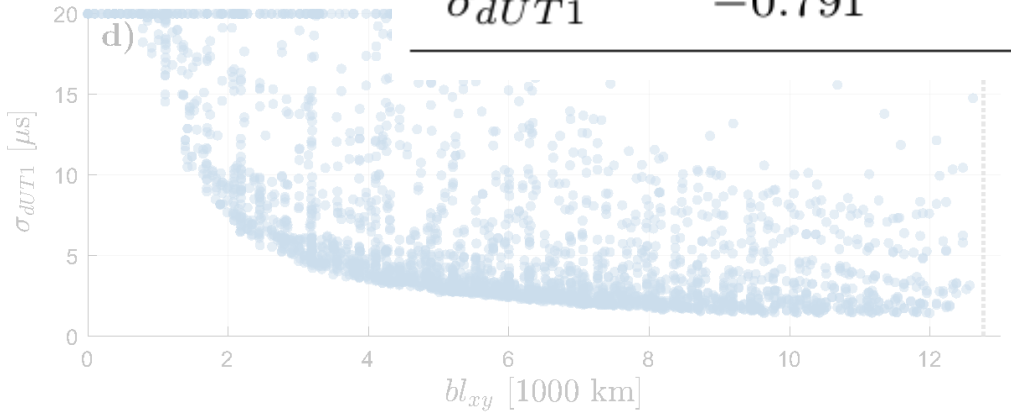
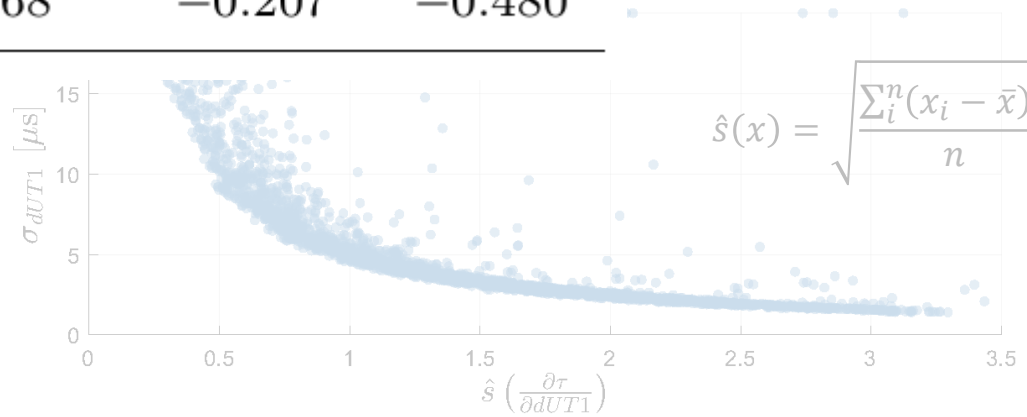




$\tilde{s}(x) = max(x) - \min(x)$

	$\hat{s}\left(\frac{\partial \tau}{\partial dUT1}\right)$	$\tilde{s}\left(\frac{\partial \tau}{\partial dUT1}\right)$	bl_{3d}	bl_{xy}
σ_{dUT1}	-0.791	-0.768	-0.207	-0.480





$\hat{s}(x) = \sqrt{\frac{\sum_i^n (x_i - \bar{x})^2}{n}}$

Conclusion

- ✓ provided a **global evaluation of VLBI baselines** for the rapid determination of dUT1 through Intensive sessions
- ✓ almost **3000 baselines** scheduled and simulated
- ✓ confirmed: **importance of corner observations**
- ✓ additional insight on **geometry of Intensive baselines**
- ➢ evaluation of Intensive baselines using **partial derivatives**

Thank you for your attention!

Contact:

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References:

Baver K, Gipson J (2015) Minimization of the UT1 Formal Error Trough a Minimization Algorithm. In: Proceedings of the 22nd European VLBI Group for Geodesy and Astronomy Working Meeting

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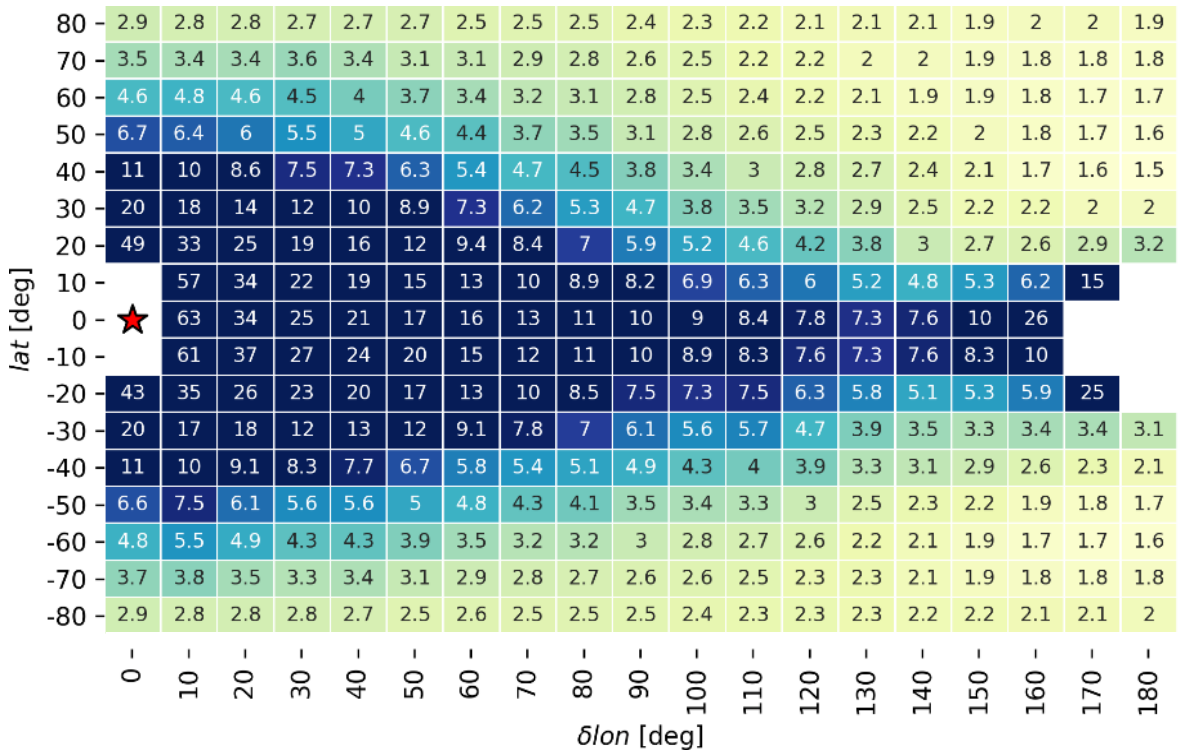
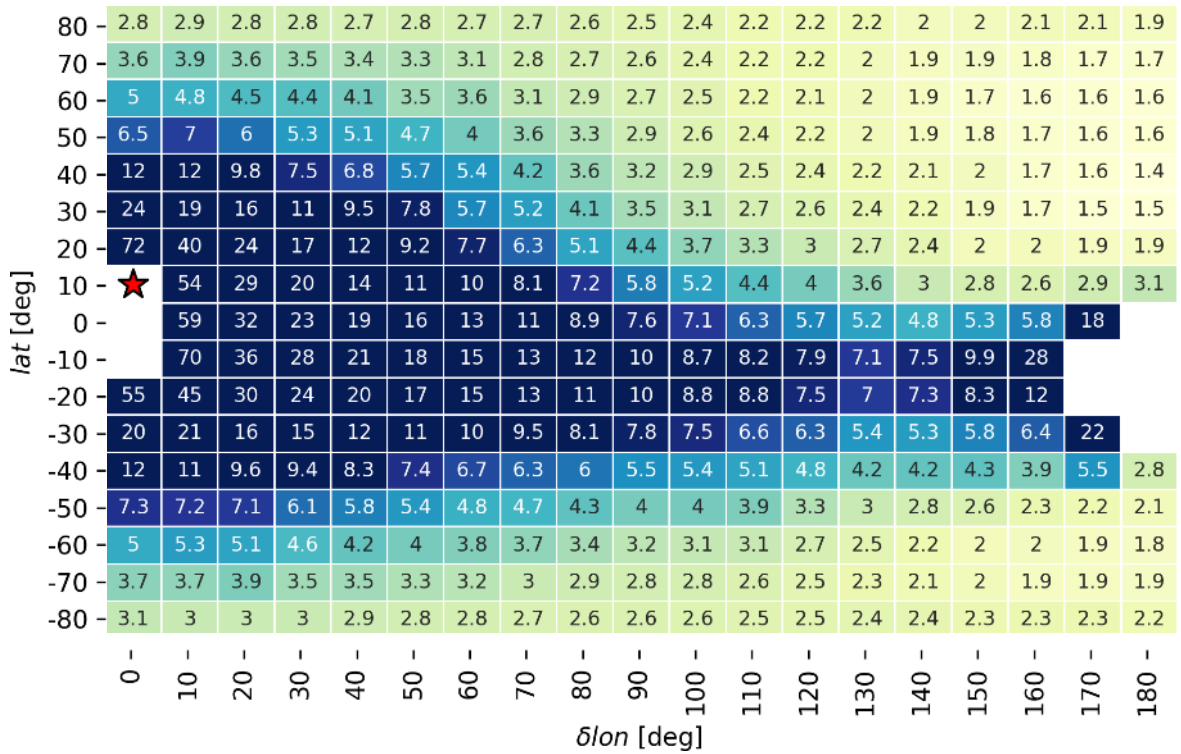
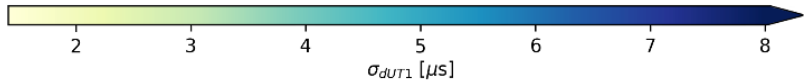
Appendix







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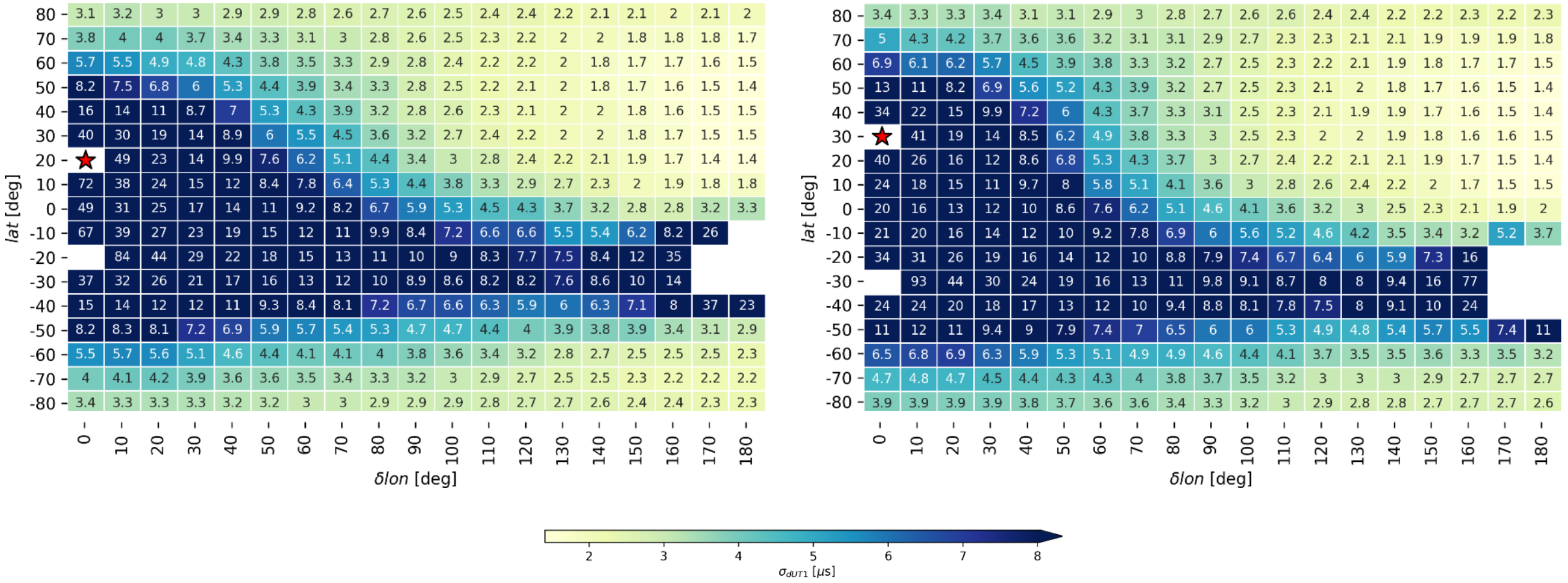

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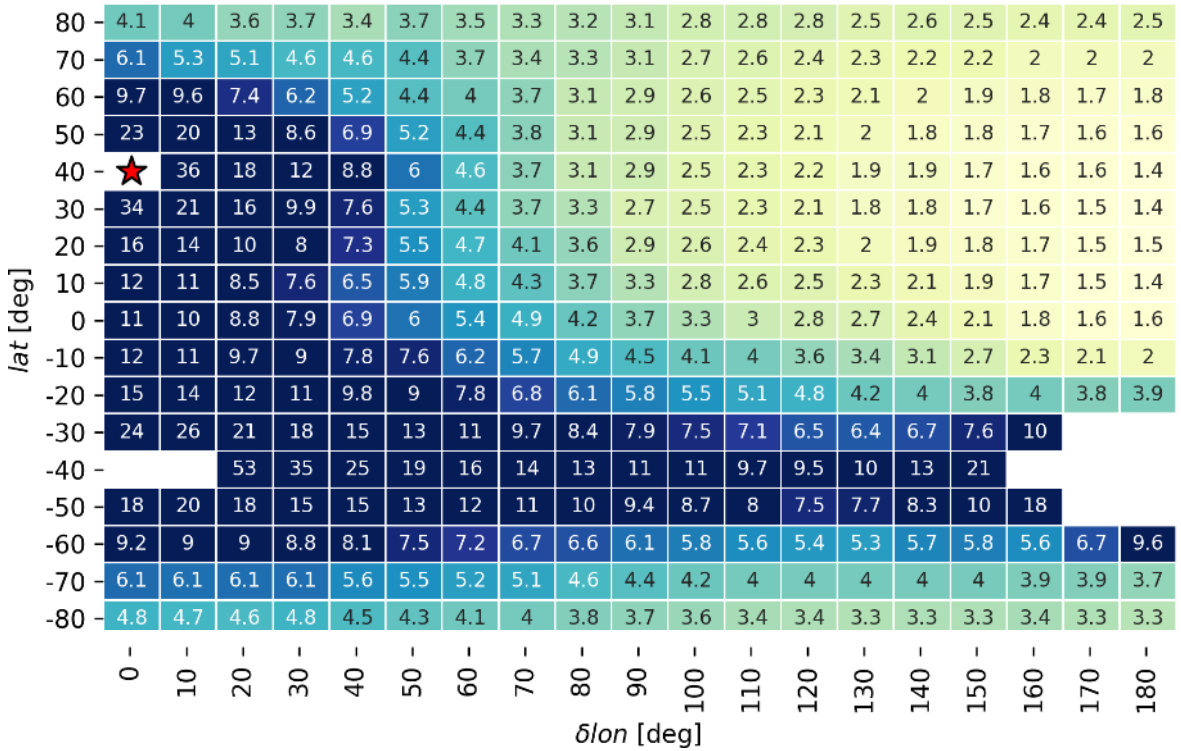

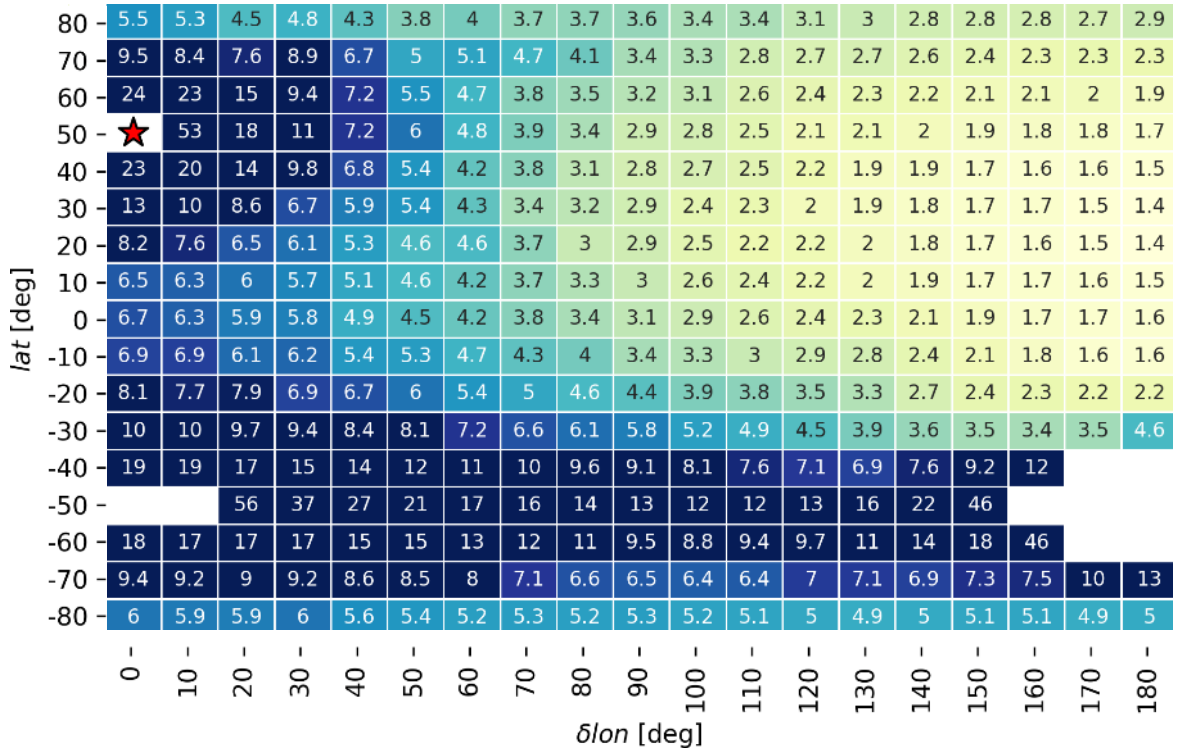

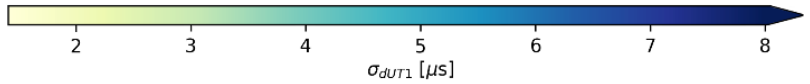

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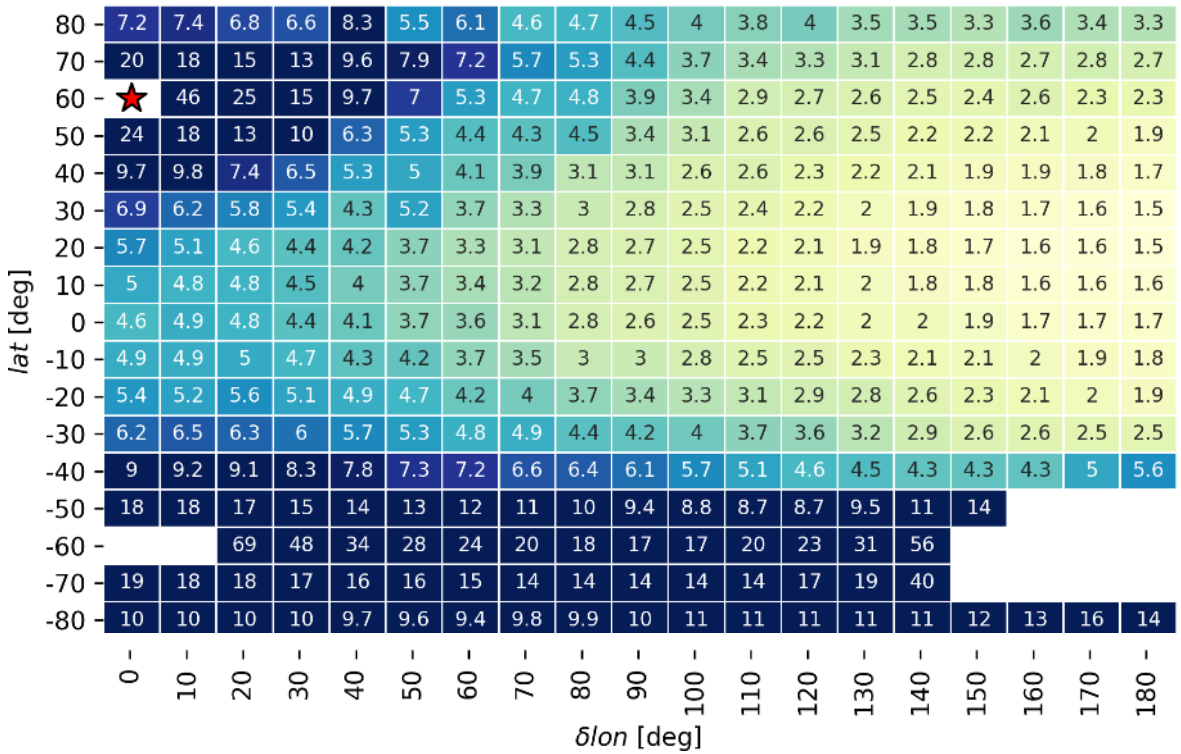

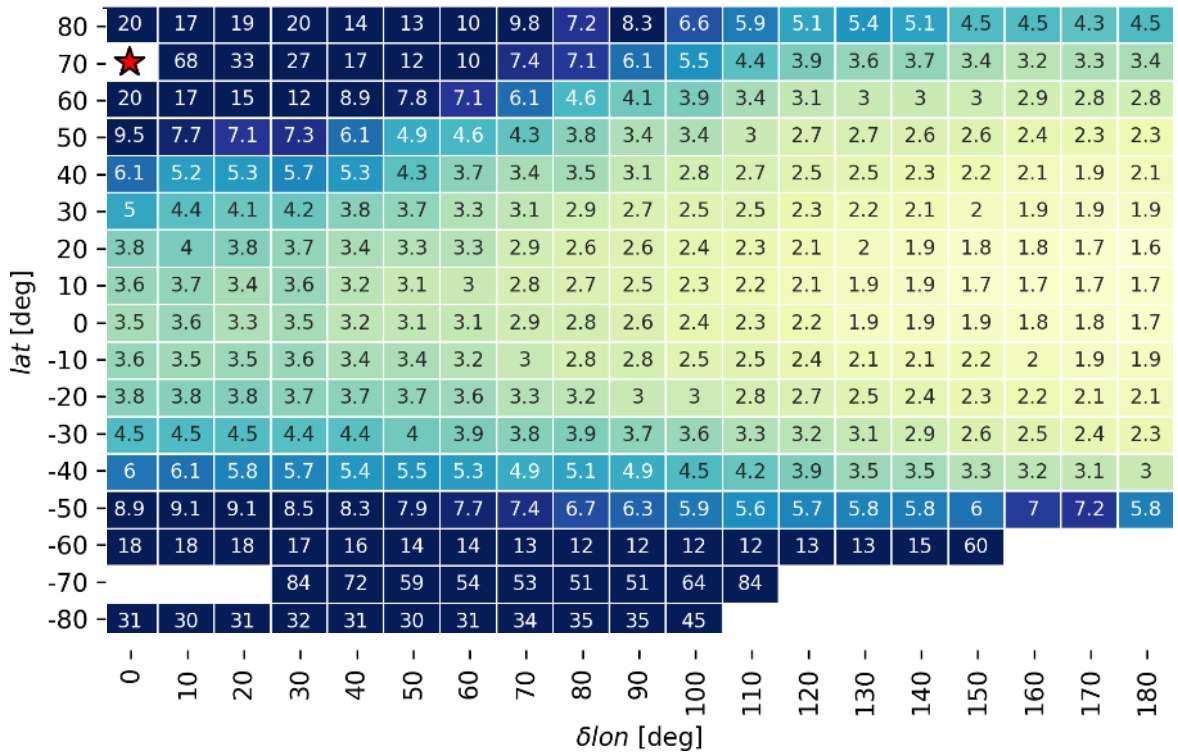

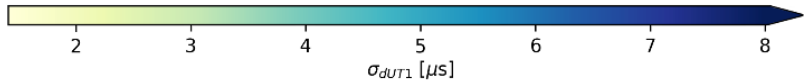

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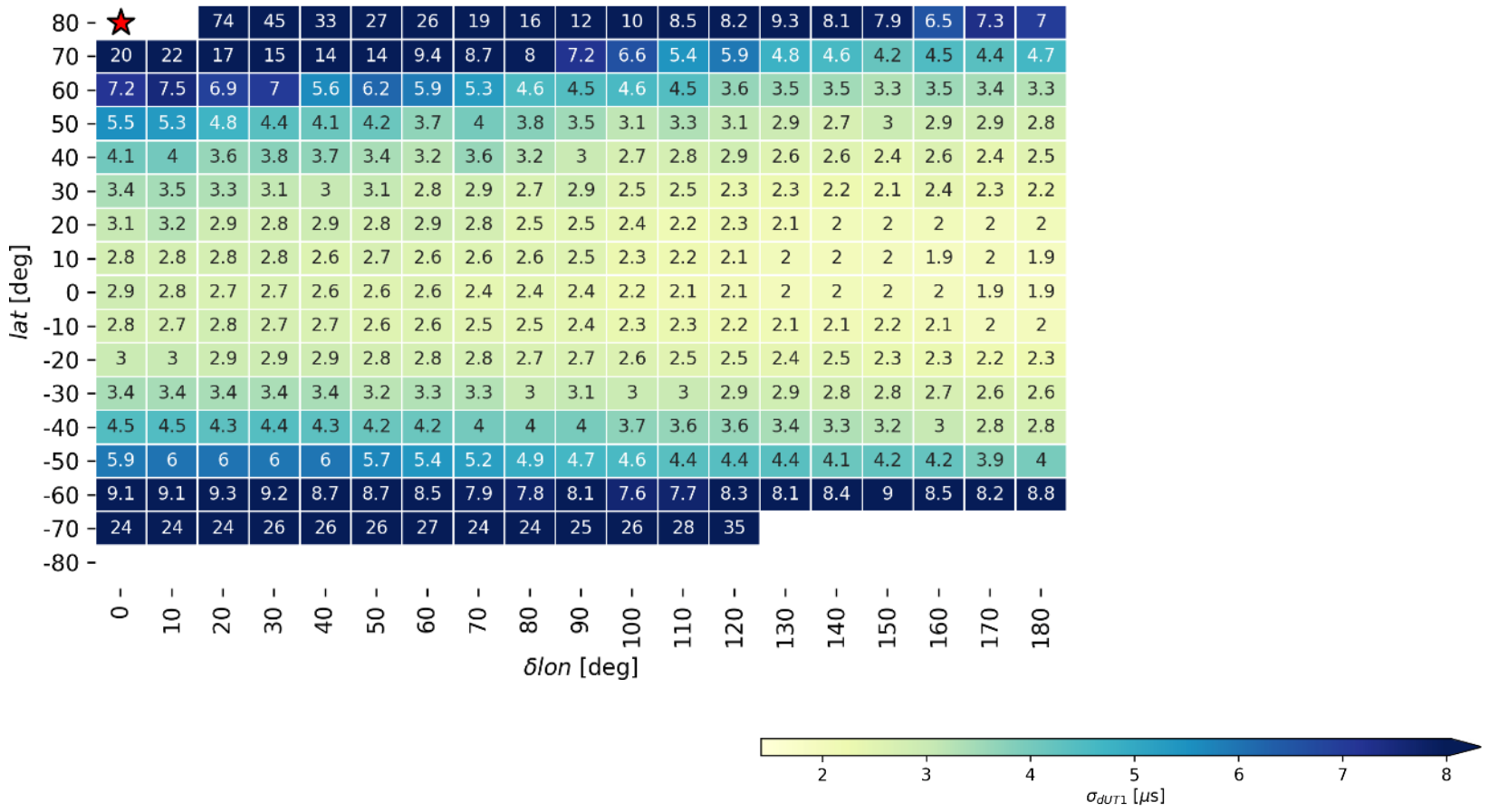

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