Equations for calculation of intra- and interfractional midline variation (norm of 3D values):

With the averaging operator $\langle \ldots \rangle$ and the standard deviation $\sqrt{\text{var}(\ldots)}$.

Midline for point in time $t$ of fraction $f$: $M^f_t = \frac{1}{101} \sum_{i=t-50}^{t+50} r^f_i$,

defined through a sliding mean of positions $r^f_i$ from 5 s before to 5 s after $t$.

Initial midline of fraction $f$ with radiation start time $t_s$: $M^f_{\text{initial}} = M^f_{t=t_s}$.

Intrafractional midline for point in time $t$ of fraction $f$: $M^f_{\text{intra}, t} = M^f_t - M^f_{\text{initial}}$.

Mean and SD of the intrafractional midline of fraction $f$:

$$M^f_{\text{mean}} = \langle M^f_{\text{intra}, t} \rangle \quad \text{and} \quad M^f_{\text{SD}} = \sqrt{\text{var}(M^f_{\text{intra}, t})}.$$ 

Interfractional mean and SD of the fraction means per patient:

$$M^\text{mean} = \langle M^f_{\text{mean}} \rangle \quad \text{and} \quad M^\text{SD} = \sqrt{\text{var}(M^f_{\text{mean}})}.$$ 

Interfractional mean and SD of the fraction SDs per patient:

$$M^\text{mean}_{\text{SD}} = \langle M^f_{\text{SD}} \rangle \quad \text{and} \quad M^\text{SD}_{\text{SD}} = \sqrt{\text{var}(M^f_{\text{SD}})}.$$