A.2 Explanation of configuration option parameters

Table A.1: Explanation of configuration parameters in data section. This section contains paths of all input files and of the seismic traces.

Name	Description
`data.path`	Path to project folder containing the seismic traces, the source and the receiver file, where source and receiver positions are specified.
`data.model`	Path to velocity model file.

Table A.2: Explanation of configuration parameters in target section. This section contains the target position.

Name	Description
`target.x`	X coordinate of target position in global Cartesian coordinate system.
`target.y`	Y coordinate of target position in global Cartesian coordinate system.
`target.z`	Z coordinate of target position in global Cartesian coordinate system.

Table A.3: Explanation of configuration parameters in source_beam_centers section. Source beam centers are created as a grid, specified by two opposing points on the edges of a rectangle and a count of points along the x and y axis.

Name	Description
`source_beam_centers.x0`	X coordinate of the first point of the rectangle.
`source_beam_centers.y0`	Y coordinate of the first point of the rectangle.
`source_beam_centers.x1`	X coordinate of the second point of the rectangle.
`source_beam_centers.y1`	Y coordinate of the second point of the rectangle.
`source_beam_centers.z`	Common depth of all source beam centres.
`source_beam_centers.num_x`	Number of points in grid along x axis.
`source_beam_centers.num_y`	Number of points in grid along y axis.

Table A.4: Explanation of configuration parameters in fractures section. This section contains information about the fracture parameters that are scanned by the Gauss beam algorithm to calculate the new scattered wave (see equation (3.48)).

Name	Description
`fractures.num_orientations`	Number of fracture orientations to scan. Orientations are scanned in a 180° arc. Every orientation is represented by a normal vector of the fracture plane. This creates the ambiguity which reduces the possible number of orientations to a 180° arc.
`fractures.spacing_min`	Minimum fracture spacing to scan.
`fractures.spacing_max`	Maximum fracture spacing to scan.
`fractures.num_spacings`	Number of fracture spacings to scan between `spacing_min` and `spacing_max`.

Table A.5: Explanation of configuration parameters in beam section. This section contains options concerning creation and evaluation of Gaussian beams.

Name	Description
`beam.width`	Initial beam width w used by equation (3.45).
`reference_frequency`	Reference frequency ω_r used by equation (3.45). This value should be given in Hertz. Agai
`beam.window_length`	Window length of cut window for seismic data. The seismic data from a source at $\vec{x}_s$, recorded at receiver $\vec{x}_r$, will be cut around the complex travel time of the Gauss beam that travels from the source to the fracture target and is scattered upwards.
`beam.max_stacking_distance`	Only sources/receivers within this radius around the surface point of the Gauss beam will be considered for stacking. This is done because the contribution from larger distances is minimal due to the exponential decay of the Gauss beam, but the calculation of the FFT for many traces is computationally expensive. Setting this parameter to an appropriate value therefore reduces computation time without influencing the result.
`beam.source_frequency`	Main frequency of seismic data, for data created by a simulation the centre frequency of the source wavelet. This value should be given in Hertz. This frequency is used for scattering equation (3.48), it is used as the frequency bin of the Fourier transformed seismic data, as the frequency of the complex exp in the Gaussian beam equation and in the scaling term $2i\omega p_z^s$ of the double beam stacking equation.