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Statistical analysis of relation between weak and strong seismic events occurrence for seismic hazard estimation

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The seismic hazard was estimated as maximal conditional probability density of strong seismic event (with magnitude $M \geq M_s$) occurrence f_s in time interval $[t_{s1}, t_{s2}]$ in point (x_s, y_s). The conditional probability density f_s calculated around each registered event and depends on its arising time t_i and its location (x_i, y_i). The expression for f_s is determined by means of analysis of empirical two arguments distribution function $\hat{F}_s(\Delta t, r)$, which is constructed for values $(\Delta t_{ijs}, r_{ijs})$. The values $(\Delta t_{ijs}, r_{ijs})$ are time interval and distance between i-th event and j-th strong event, but they should be minimal time interval for fixed distance and minimal distance for fixed time interval (there are no k that $\Delta t_{iks} < \Delta t_{ijs}$ and $r_{iks} < r_{ijs}$). In this case $f_s(r, t_{s1}, t_{s2}, M_s, x_i, y_i, t_i) =$

$$= \left(\frac{1}{2\pi r} \ \partial(F_s(r, t_{s2} - t_i, M_s) - F_s(r, t_{s1} - t_i, M_s)) \frac{}{\partial r} \right|_{r=\sqrt{(x_s-x_i)^2+(y_s-y_i)^2}} .$$

Seismic hazard can be estimated for any time interval and it will be automatically recalculated with registration of new events. This approach for seismic hazard estimation was successfully applied for Altai-Sayan region (Russia). In quarter estimations about 25% of analyzed area, which was marked as most dangerous, include 80. . . 100% of strong earthquakes (with magnitude $M \geq 3.5$).