Robust Density-Based Clustering to Identify Metastable Conformational States of Proteins
– Supporting Information –

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Figure S1: Ramacolor plot of Ala7, showing the dihedral angle content of its 32 metastable states. Red residues indicate β-sheet, green residues indicate α-helical conformations.

Figure S2: Transition network of Ala7. States are ordered counter-clockwise by population. Edge-thickness scales by transition rates, node sizes correspond to state populations. Node labels denote the dihedral conformation of the state, with residues either in β- or α-conformation. The network shows clearly that Ala7 dynamics are essentially uncorrelated.
Figure S3: Verification of Chapman-Kolmogorov equation for Ala$_7$. Top diagram (a) shows metastabilities $T_{ii}^{20\text{ ps}/\tau}(\tau)$ after propagation to 20 ps for $\tau = 1$ ps (green), $\tau = 5$ ps (red) and $\tau = 10$ ps (blue). Bottom diagram (b) shows differences in population after propagation of an initially equally distributed population $p$. Compared are the same lag times as in (a) to a propagation with $T(\tau = 20\text{ ps})$, i.e., pop. diff. $\equiv \|pT_{ii}^{20\text{ ps}/\tau}(\tau) - pT(\tau = 20\text{ ps})\|$. 

Figure S4: Verification of Chapman-Kolmogorov equation for HP-35. a: Metastabilities $T_{ii}^{160\text{ ns}/\tau}(\tau)$ after propagation to 160 ns for $\tau = 10$ ns (green), $\tau = 20$ ns (red) and $\tau = 40$ ns (blue). b: Differences (relative) in population after propagation of an initially equally distributed population $p$. Compared are the same lag times as in (a) to a propagation with $T(\tau = 160\text{ ns})$, i.e., pop. diff. $\equiv \|pT_{ii}^{160\text{ ns}/\tau}(\tau) - pT(\tau = 160\text{ ns})\|$
Figure S5: Density network for BPTI with free energy levels from 0.1 kT to 12.0 kT in steps of 0.1 kT.
Figure S6: Markov state model of BPTI resulting from density-based geometric clustering and successive dynamical clustering via MPP on reduced dihedral-angle PCs.

Figure S7: Dihedral angle content for BPTI after: primitive clustering (a), density-based geometric microstate generation and successive dynamical clustering via MPP (b) and density-based geometric clustering without dynamical corrections (c).