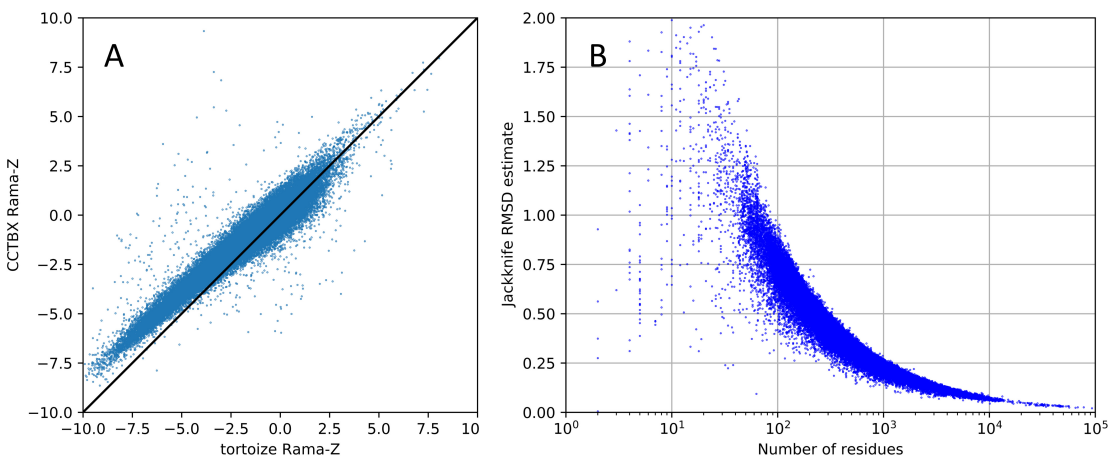
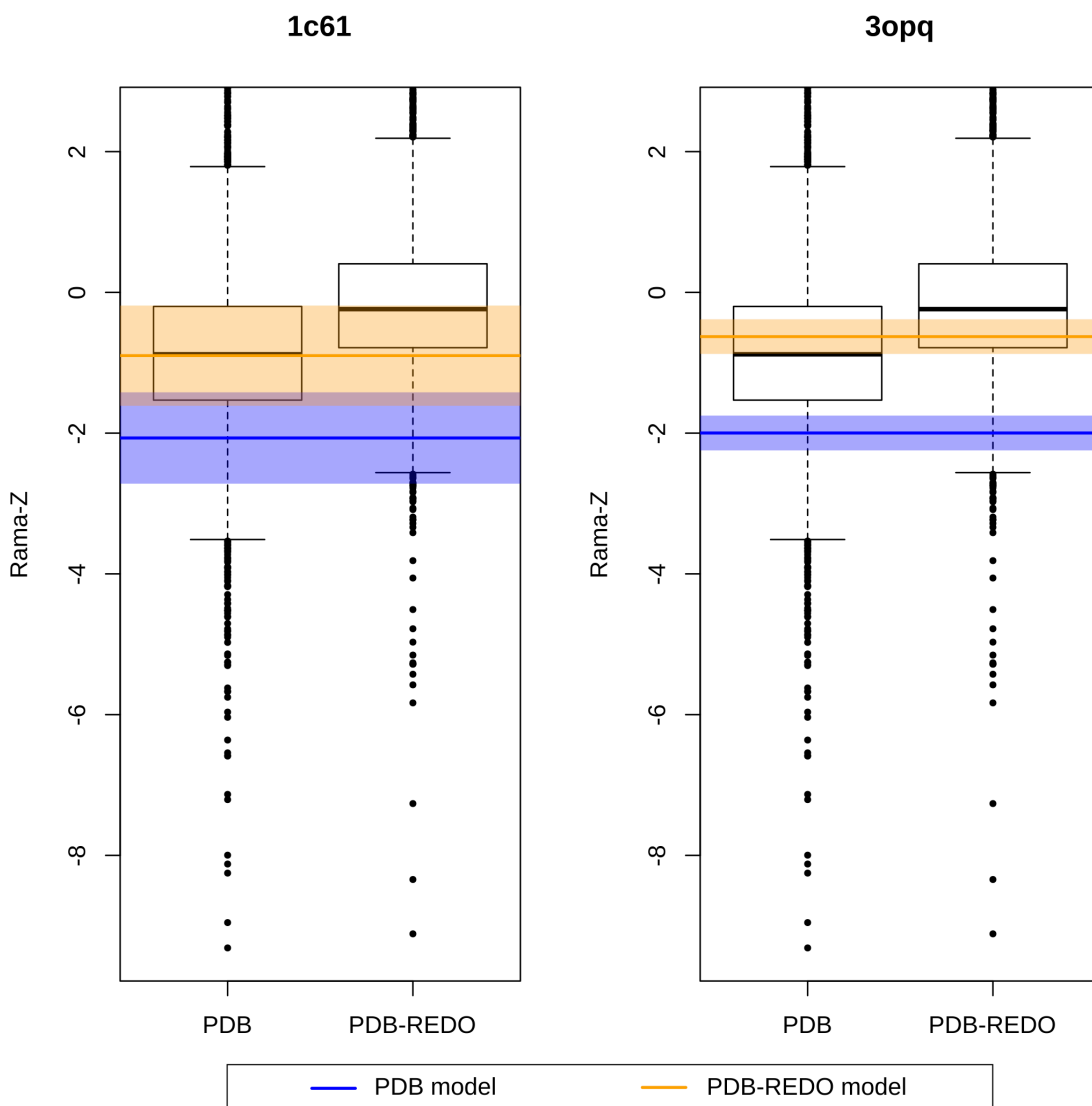


**Figure S1. Related to Results and discussion section 'High values of Rama-Z score from cryo-EM' and Figure 6.** Examples of grid-like distributions on Ramachandran plot with high Rama-Z score. Triplets of numbers on the bottom right on each plot indicate, from top to bottom: percentage of residues in favored and outlier regions, Rama-Z.



**Figure S2. Validating the Rama-Z implementations and RMSD estimation. Related to STAR methods section 'Rama-Z implementation' and 'Rama-Z reliability'.** Validating the Rama-Z implementations and RMSD estimation A. Rama-Z from CCTBX vs Rama-Z from *tortoise* for 124518 PDB-REDO entries; the diagonal is marked as a black line. B. Jackknife RMSD estimations (blue dots).



**Figure S3. Related to STAR methods section 'Rama-Z reliability'.** Two examples for the use of the RMSD value of Rama-Z in PDB-REDO: in 1c61 the improvement of the Rama-Z (blue line to orange line) appears significant, but it is not considering the large RMSD for this small structure (blue and orange background, indicating 1= RMSD); in 3opq a similar absolute value change in Rama-Z can be considered significant using the same criterion.

**Table S1. Related to STAR methods section 'Rama-Z implementation'. Residue counts.**

Residue type	Helix	Sheet	Loop
ALA	70631	19896	42026
LEU	67451	30469	43158
GLU	49958	12828	35618
LYS	36805	12588	32908
VAL	35831	39369	39014
ARG	35611	12931	28789
ILE	33485	27816	29069
SER	33288	15612	41675
ASP	32091	11212	43895
GLY	31498	16608	70883
THR	27955	19858	35816
GLN	27391	7765	20117
PHE	22729	16370	24794
ASN	22412	8715	32360
TYR	19585	13879	22883
MET	16014	6738	10847
HIS	12777	6802	16117
transPRO	12581	7615	47244
prePRO	12093	8164	44056
TRP	8341	5154	9754
CYS	6606	5211	8371
cisPRO	-	-	3953

**Table S2. Related to STAR methods section 'Key Resource Table'.**

REAGENT or RESOURCE	SOURCE	IDENTIFIER
Deposited Data		
The model was used to generate the Ramachandran plot on Figure 1 and Graphical abstract	Anderson <i>et al.</i> , 2002	PDB ID: 1ix9
The model was used to generate the Ramachandran plot on Figure 1	Kumar <i>et al.</i> , 2015	PDB ID: 5a9z
The model was used to generate the Ramachandran plot on Figure 1	Coleman <i>et al.</i> , 2019	PDB ID: 6dzv
The model was used to generate the Ramachandran plot on Figure 4	Twomey <i>et al.</i> , 2017	PDB ID: 5vhw
The model was used to generate the Ramachandran plot on Figure 4	Gorzelnik <i>et al.</i> , 2016	PDB ID: 5kip
The model was used to generate the Ramachandran plot on Figure 4	Myasnikov <i>et al.</i> , 2016	PDB ID: 5Lks
The model was used to generate the Ramachandran plot on Figure 4 and Graphical abstract	Ding <i>et al.</i> , 2019	PDB ID: 6j2q
The model was used to generate the Ramachandran plot on Figure 4	Li <i>et al.</i> , 2015	PDB ID: 3ja8
The model was used to generate the Ramachandran plot on Figure 4	Croll, 2018	PDB ID: 6eyc
The model was used to generate the Ramachandran plot on Figure 4	von der Ecken <i>et al.</i> , 2015	PDB ID: 3j8a
The model was used to generate the Ramachandran plot on Figure 4	Sobti <i>et al.</i> , 2016	PDB ID: 5t4q
The model was used to generate the Ramachandran plot on Figure 4	Urnavicius <i>et al.</i> , 2018	PDB ID: 6f38
The model was used to generate the Ramachandran plot on Figure 4	Estrozi <i>et al.</i> , 2011	PDB ID: 2xkv
The model was used to generate the Ramachandran plot on Figure 4	Vassal-Stermann <i>et al.</i> , 2019	PDB ID: 6qnt
The model was used to generate the Ramachandran plot on Figure 4	Zhao <i>et al.</i> , 2017	PDB ID: 5voy
The model was used to generate the Ramachandran plot on Figure 5	Juers <i>et al.</i> , 2001	PDB ID: 1jz7
The model was used to generate the Ramachandran plot on Figure 5	Bartesaghi <i>et al.</i> , 2014	PDB ID: 3j7h
The model was used to generate the Ramachandran plot on Figure 6	Ecken <i>et al.</i> , 2016	PDB ID: 5jLh
The model was used to generate the Ramachandran plot on Figure 6 and Graphical abstract	Risi <i>et al.</i> , 2018	PDB ID: 6g2t
The model was used to generate the Ramachandran plot on Figure 7	Leulliot <i>et al.</i> , 2004	PDB ID: 1rje
The model was used to generate the Ramachandran plot on Figure 7	Huang <i>et al.</i> , 2004	PDB ID: 1ycy
The model was used to generate the Ramachandran plot on Figure 7	Xu <i>et al.</i> , 2012	PDB ID: 3vbb
The model was used to generate the Ramachandran plot on Figure 7	Schmidt <i>et al.</i> , 2012	PDB ID: 4akg
The model was used to generate the Ramachandran plot on Figure 7	Khan <i>et al.</i> , 2015	PDB ID: 4s0s
The model was used to generate the Ramachandran plot on Figure 7	Ma & Yun, 2018	PDB ID: 6adg
The model was used to generate the Ramachandran plot on Figure S1	Risi <i>et al.</i> , 2018	PDB ID: 6cxi
The model was used to generate the Ramachandran plot on Figure S1	Risi <i>et al.</i> , 2018	PDB ID: 6cxj