

Supplementary Table 1. Residue-specific chemical shift differences ($\Delta\omega$) between the ground and excited states of yAAC3 determined from the fitting of relaxation dispersion data to a two-state exchange model

Residue Number	Free yAAC3 ^{15}N $\Delta\omega$ (ppm)	yAAC3-ADP ^{15}N $\Delta\omega$ (ppm)	yAAC3-CATR ^{15}N $\Delta\omega$ (ppm)
21	1.0 \pm 0.5	no data	no data
26	5.7 \pm 0.9	5.9 \pm 0.4	6.1 \pm 1.0
27	3.5 \pm 0.7	2.2 \pm 1.4	2.6 \pm 0.8
30	3.6 \pm 1.1	2.9 \pm 1.5	no data
31	5.5 \pm 1.4	5.3 \pm 1.1	5.7 \pm 1.4
41	3.1 \pm 0.2	3.7 \pm 1.0	4.6 \pm 0.8
42	4.6 \pm 0.6	4.0 \pm 1.0	no data
61	4.7 \pm 0.5	3.2 \pm 1.2	3.1 \pm 0.3
70	2.2 \pm 0.3	1.8 \pm 1.3	1.2 \pm 0.4
78	1.3 \pm 0.2	no data	no data
81	1.2 \pm 0.2	1.4 \pm 0.4	no data
82	2.5 \pm 0.7	1.8 \pm 0.9	1.5 \pm 0.2
84	3.7 \pm 1.2	4.2 \pm 1.3	5.1 \pm 1.2
85	4.9 \pm 1.2	7.8 \pm 1.5	no data
91	1.2 \pm 0.2	1.3 \pm 0.5	4.9 \pm 0.5
95	2.1 \pm 0.8	2.0 \pm 1.1	2.7 \pm 0.6
96	3.2 \pm 0.3	no data	no data
124	1.2 \pm 0.2	no data	no data
146	1.1 \pm 0.6	0.3 \pm 0.2	no data
166	1.1 \pm 1.0	0.8 \pm 0.6	no data
167	no data	1.1 \pm 0.2	no data
170	1.5 \pm 0.6	no data	no data
174	1.3 \pm 0.3	1.1 \pm 0.3	no data
246	2.4 \pm 0.2	1.6 \pm 0.2	1.5 \pm 0.3
247	1.2 \pm 0.6	0.9 \pm 0.5	0.7 \pm 0.5
268	1.4 \pm 0.3	1.1 \pm 0.3	0.6 \pm 0.5
291	5.5 \pm 1.4	no data	5.3 \pm 0.4
292	not resolved	not resolved	6.2 \pm 0.4
294	4.5 \pm 0.2	4.2 \pm 1.0	no data

Supplementary Table 2. Kinetic and thermodynamic parameters of yAAC3 derived from relaxation dispersion measurements measured at three fields.

State	Protein Region	k_{ex} (s^{-1})	p_e (%)
Free yAAC3	TM helices	470 ± 100	1.5 ± 0.2
yAAC3-ADP	TM helices	1600 ± 300	2.2 ± 0.5