

Decay-out of Superdeformed bands by coupling to ordered or chaotic spectra

-> **Decay-out of ^{59}Cu**
by coupling to specific states

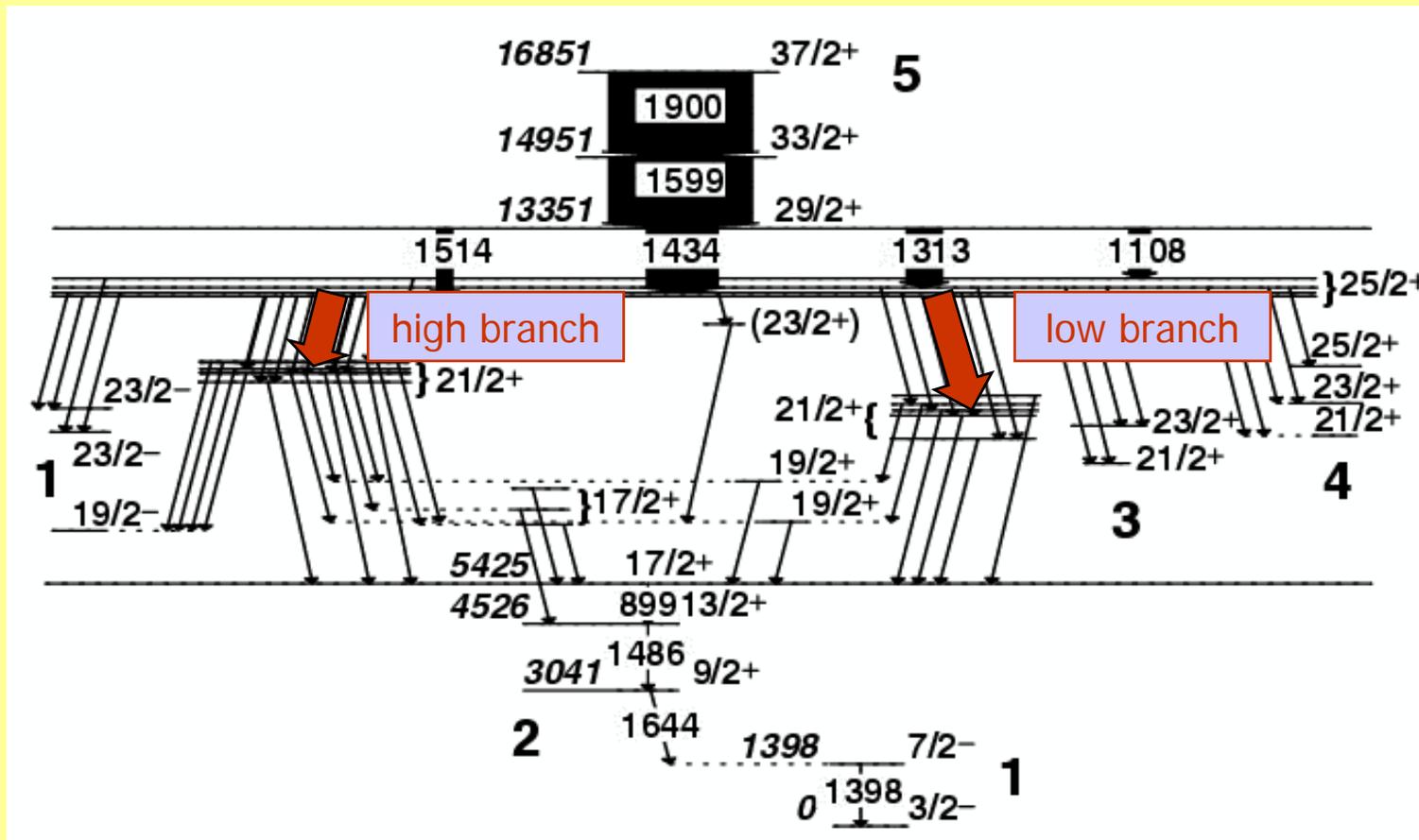
-> **Decay-out of heavy nuclei**
by coupling to dense spectrum of
ordered or chaotic states

- representation of states by
sparse matrices

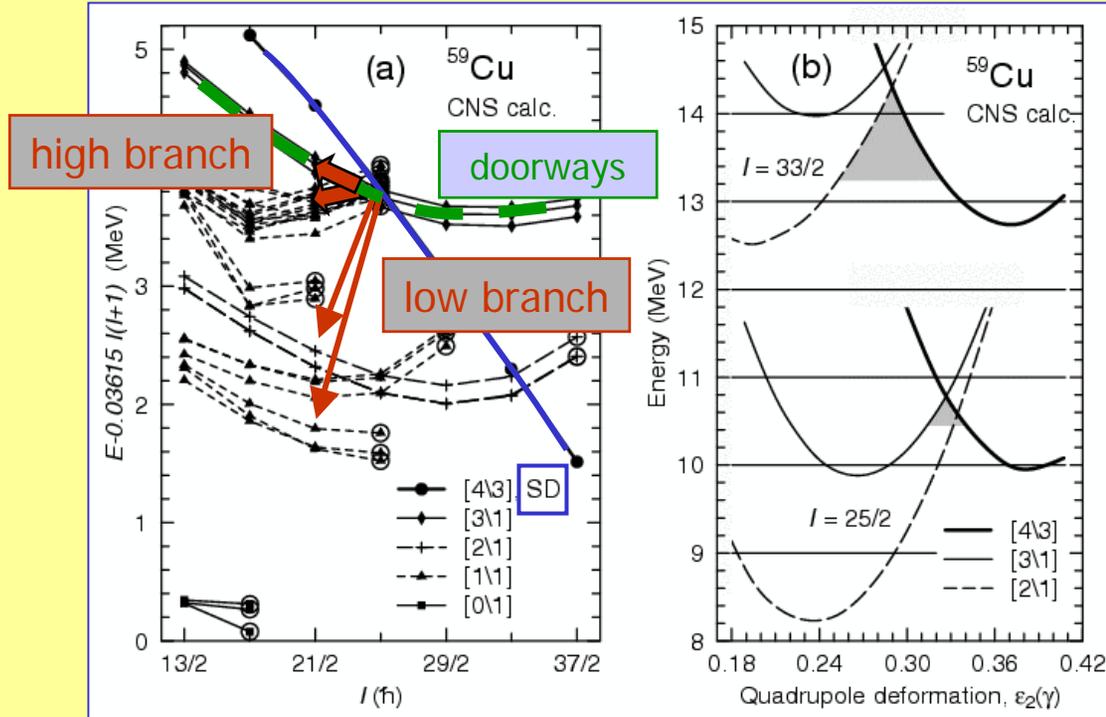
C. Andreoiu
D. Rudolph
C. Fahlander
I. Ragnarsson
S. Åberg

A.P. Lopez-Martens
T-L Khoo
T. Lauritsen
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T. Døssing

decay-out of SD band in ^{59}Cu



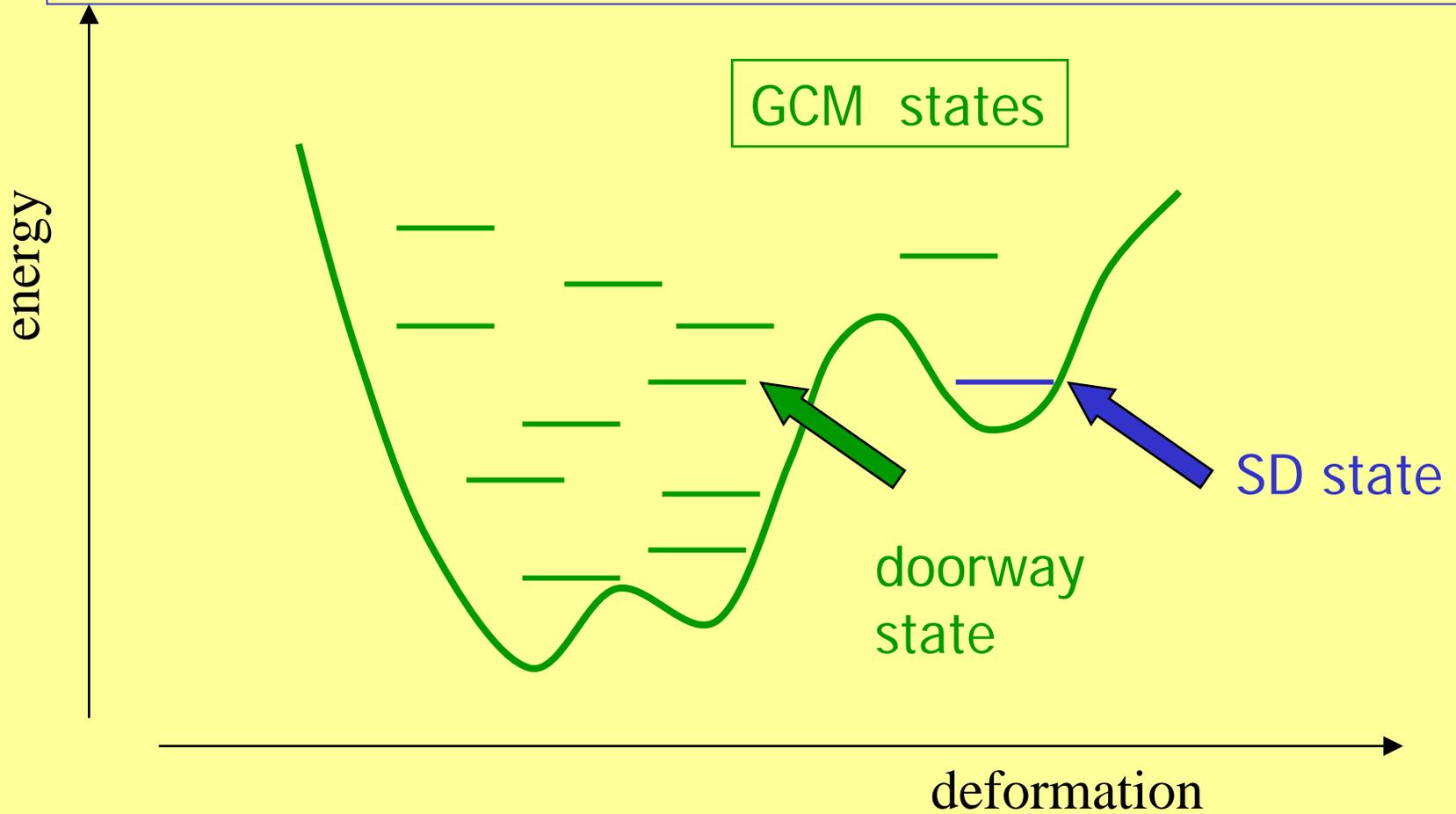
^{59}Cu – states at decay-out



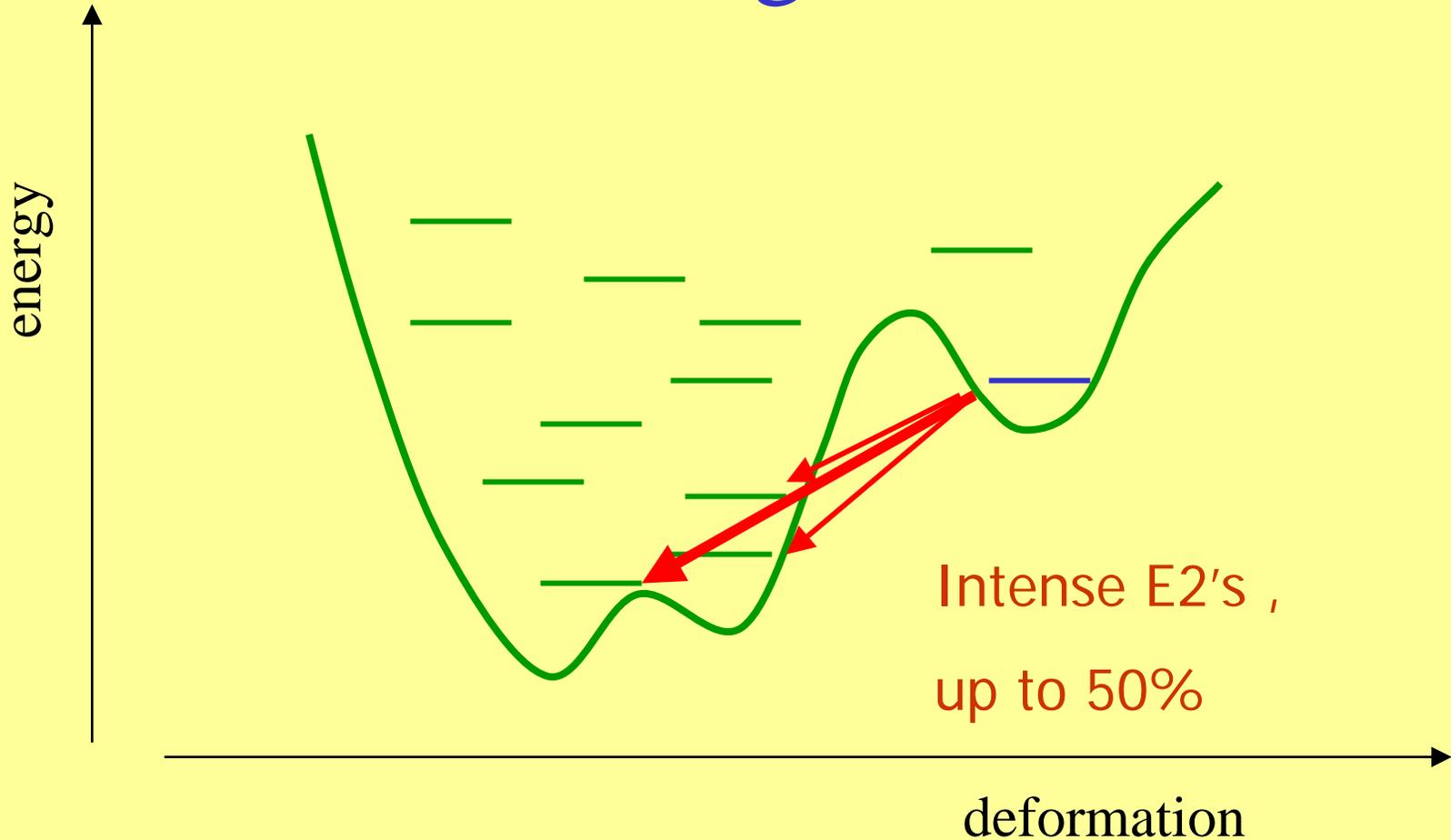
calculations by I. Ragnarsson

C. Andreoiu et. al.,
PRL 91(2003)232502

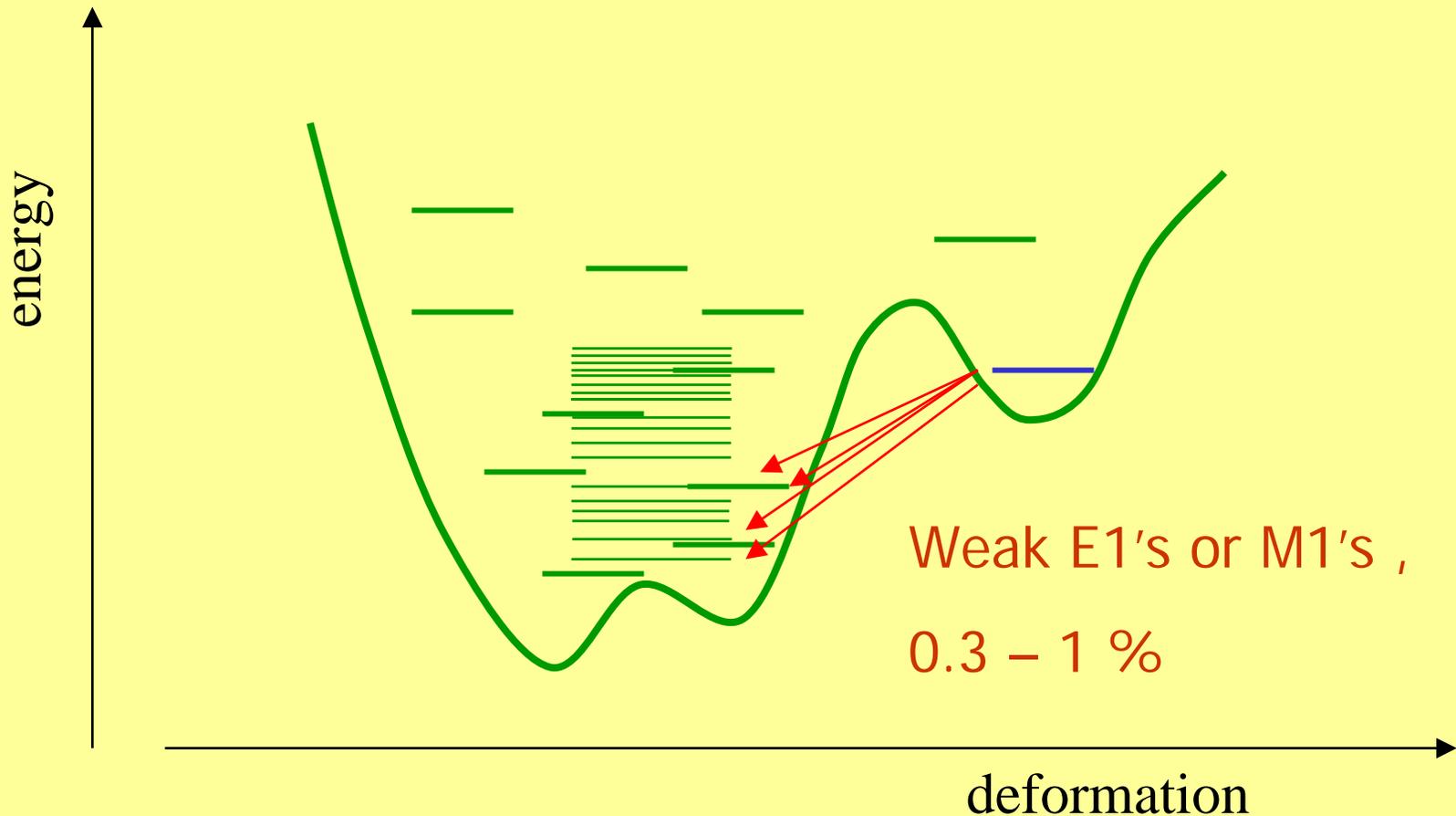
ND and SD wells in heavy nuclei



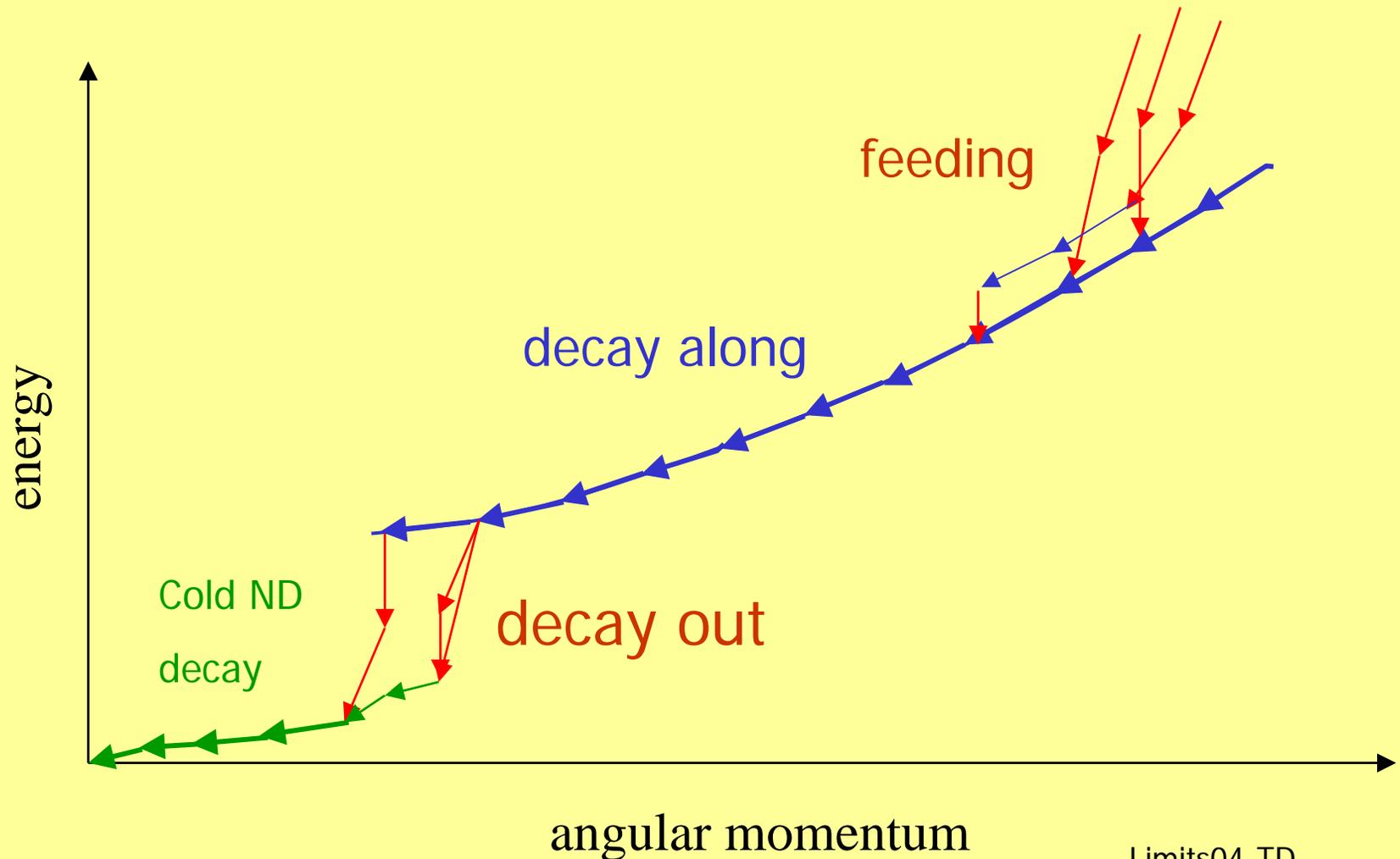
Decay-out of SD state according to GCM



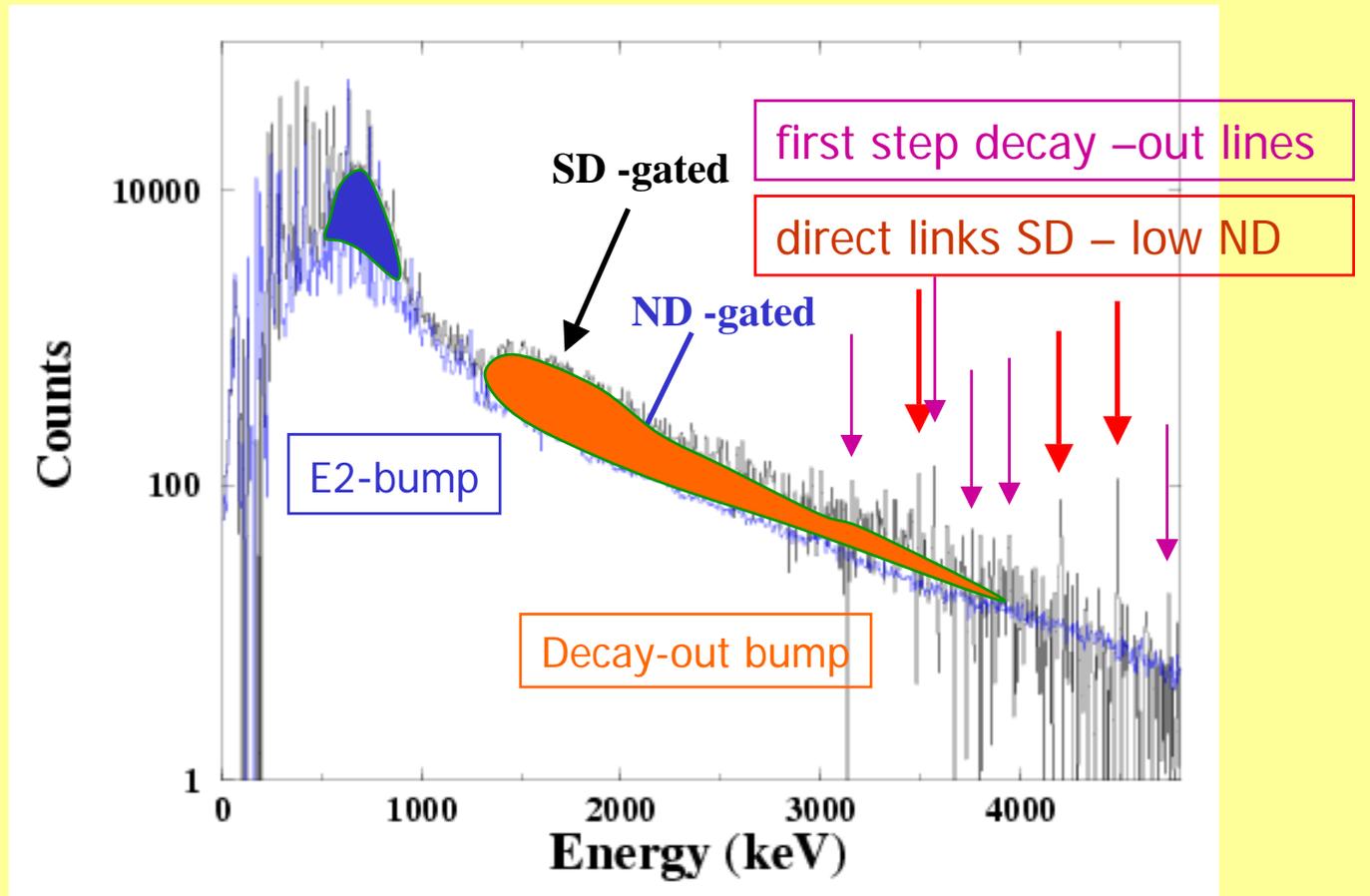
Decay-out via coupling to dense spectrum of ND states



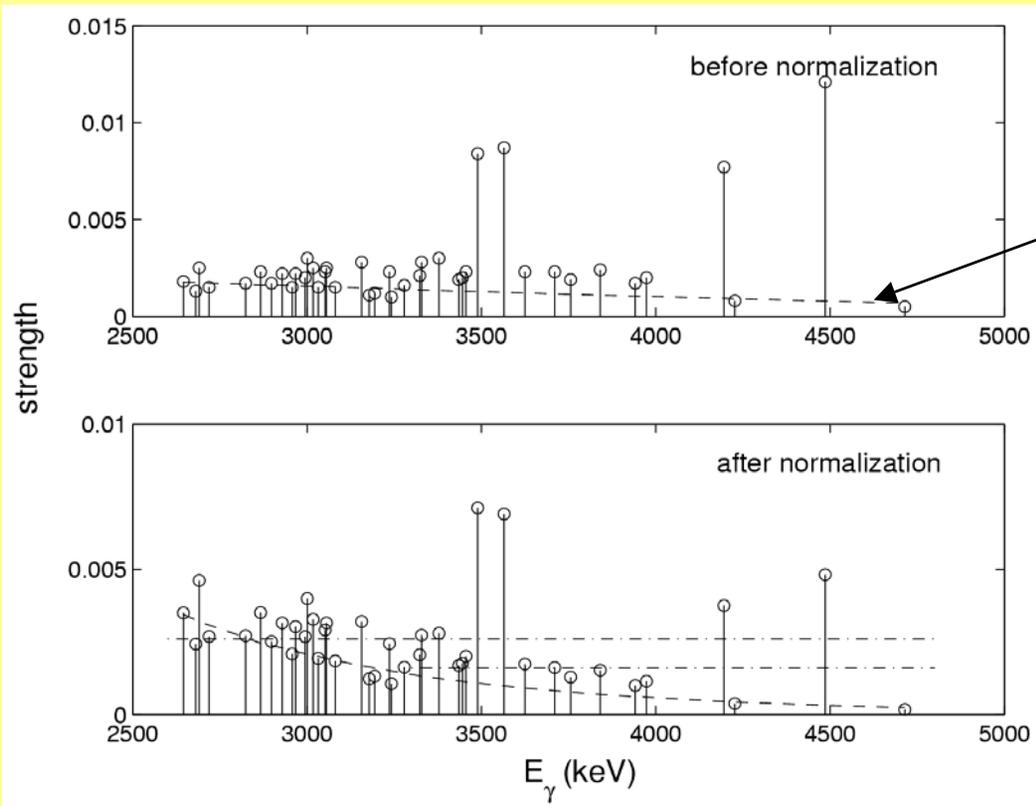
Cascades including SD band



Gated spectra – ^{194}Hg



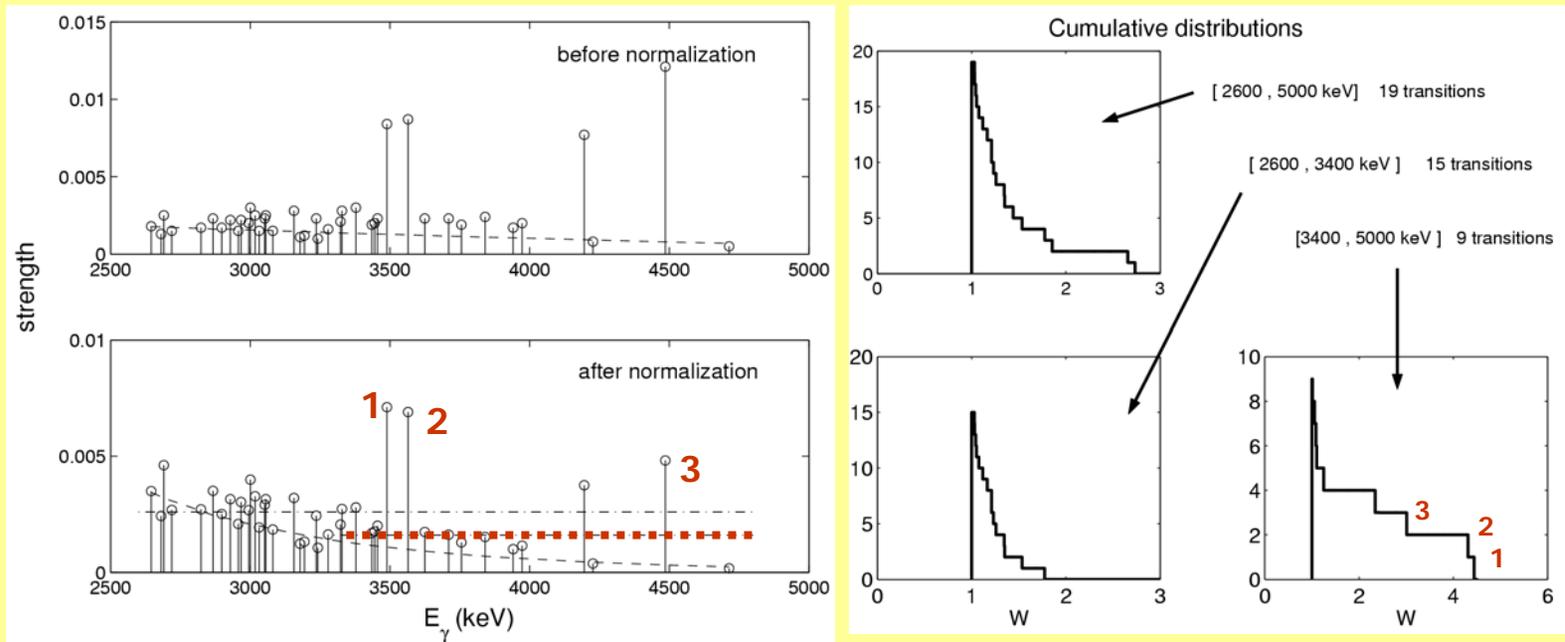
Decay-out strengths



3σ detection
limit

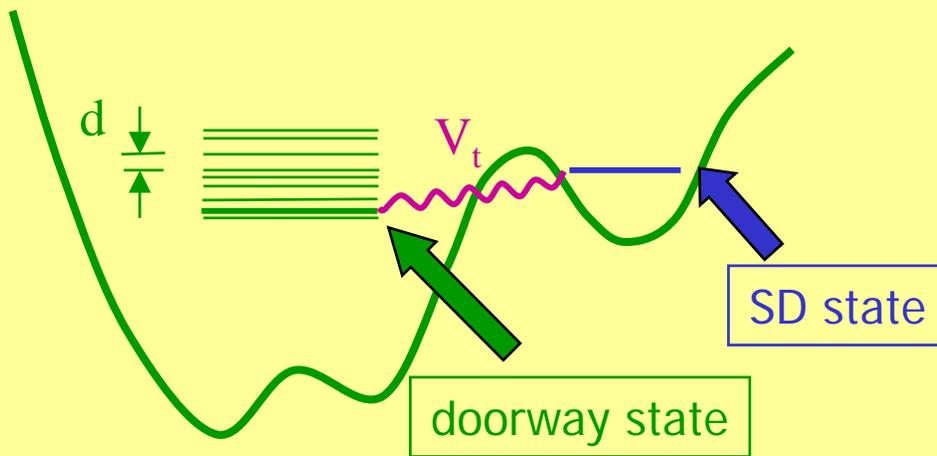
normalization by
 $(E_{\gamma 0}/E_\gamma)^3$

Statistical view on decay-out strengths: Cumulative distributions



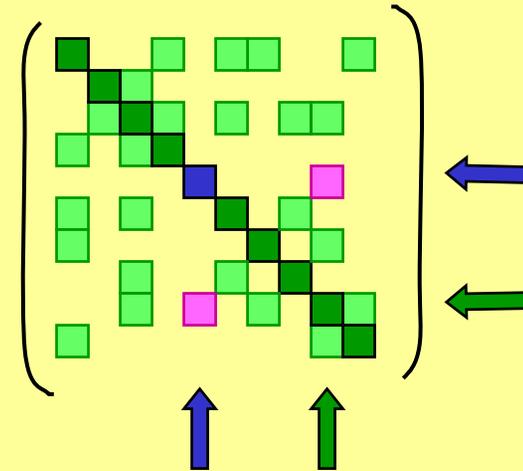
Statistical calculation of ND admixtures into SD band: sparse matrices

Selected basis:



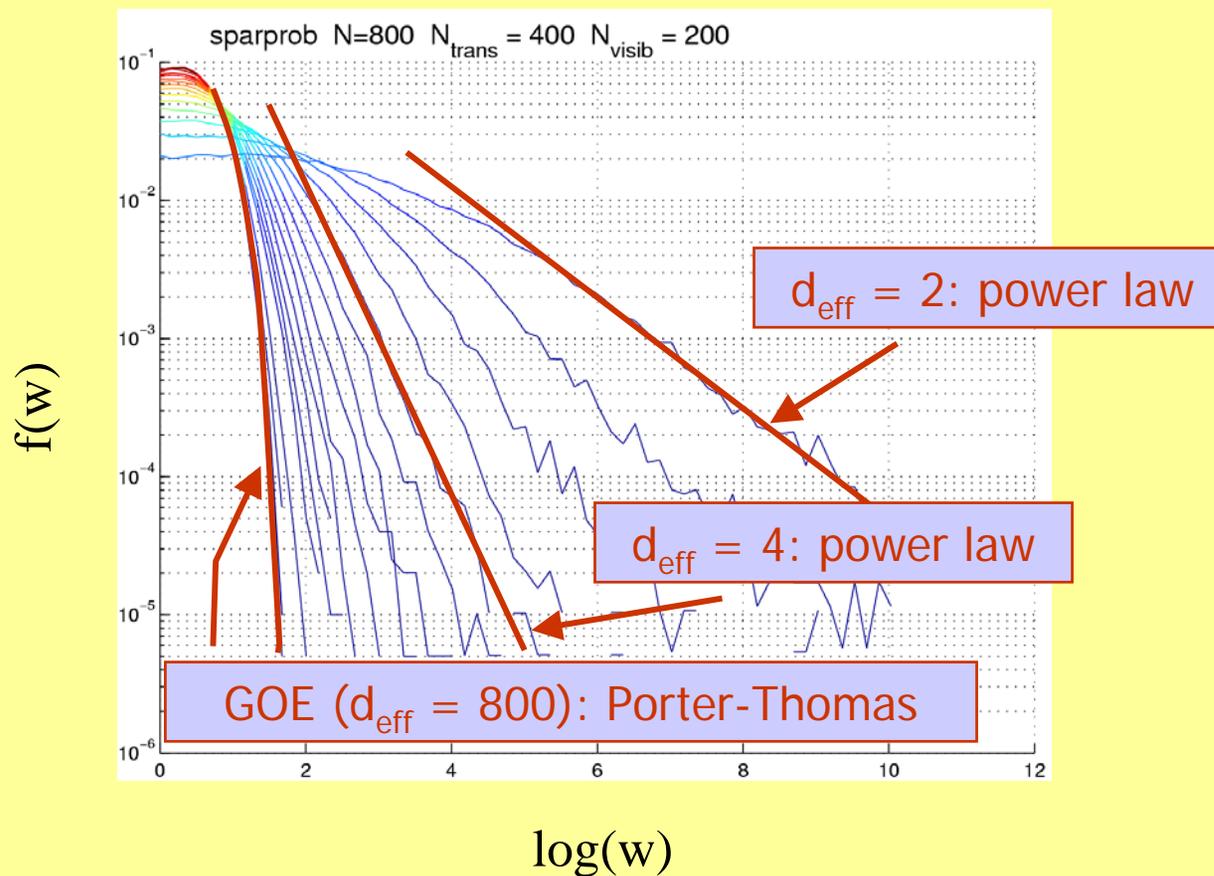
weak coupling limit: $V_t \ll d$

Hamiltonian matrix:
sparse GOE matrix



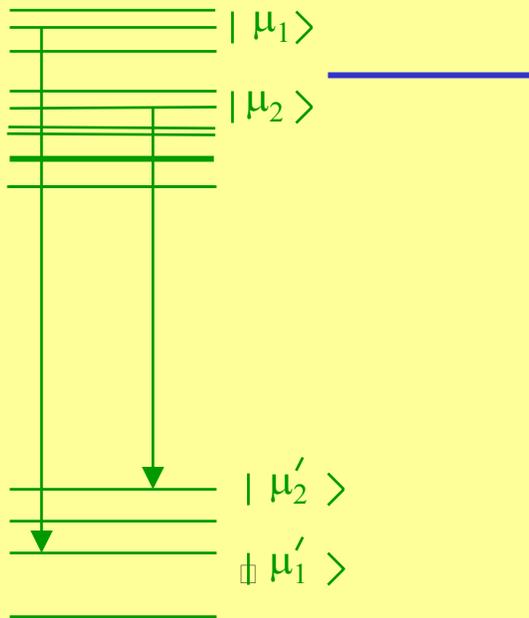
effective dimensionality
 d_{eff} = avg. no. of non-zero
 off. diag. matrix elements in row

Distribution functions of ND states admixed into the SD band

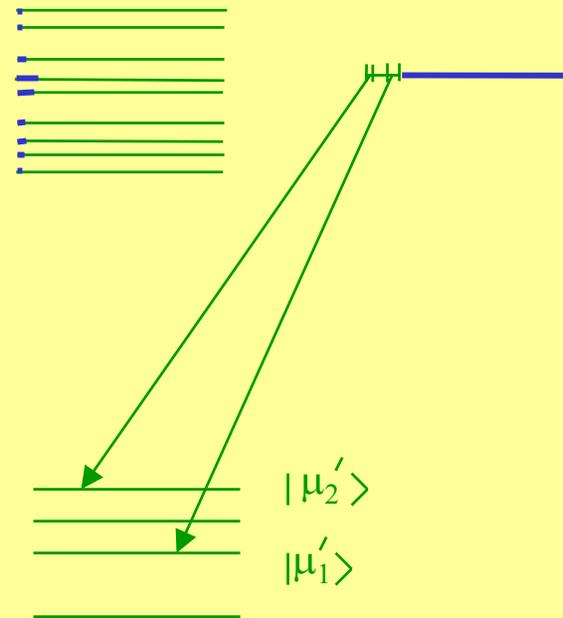


Conjecture: admixtures \rightarrow decay strengths

basis states:



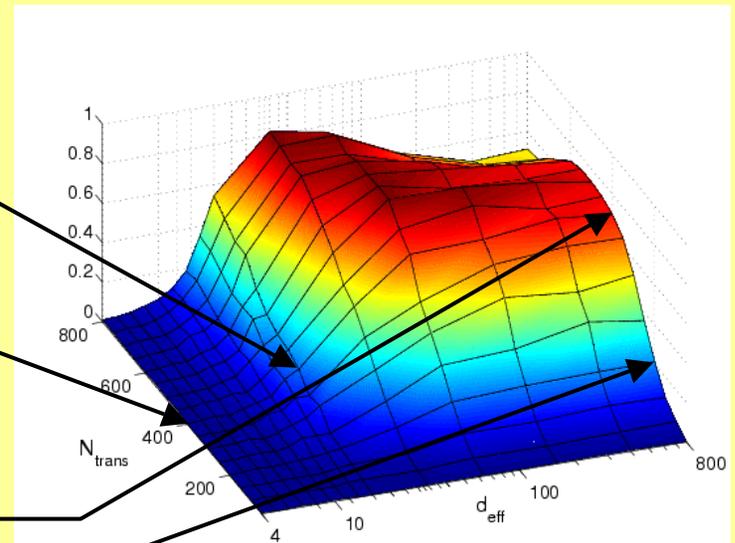
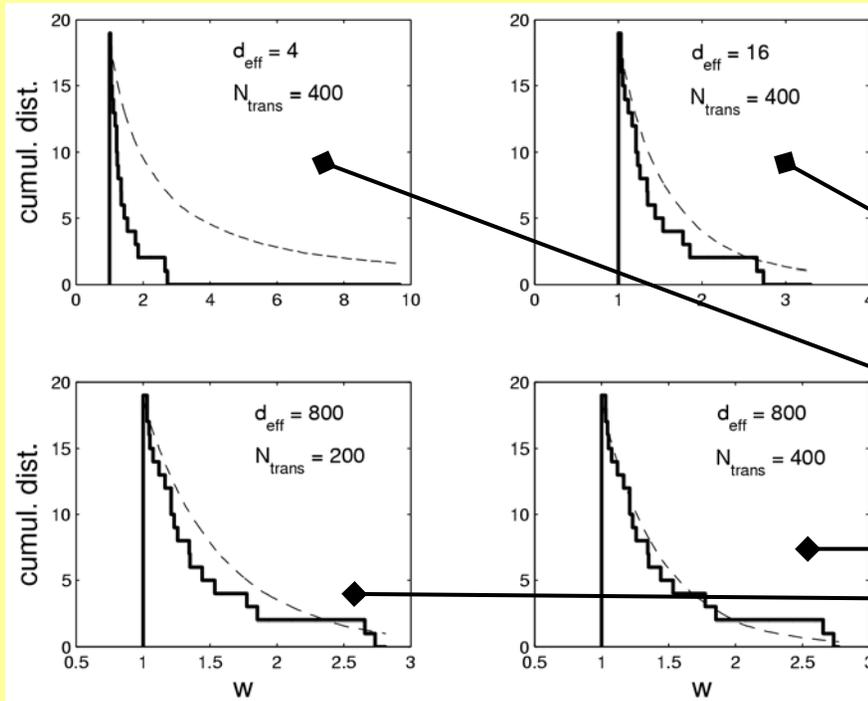
mixed states:



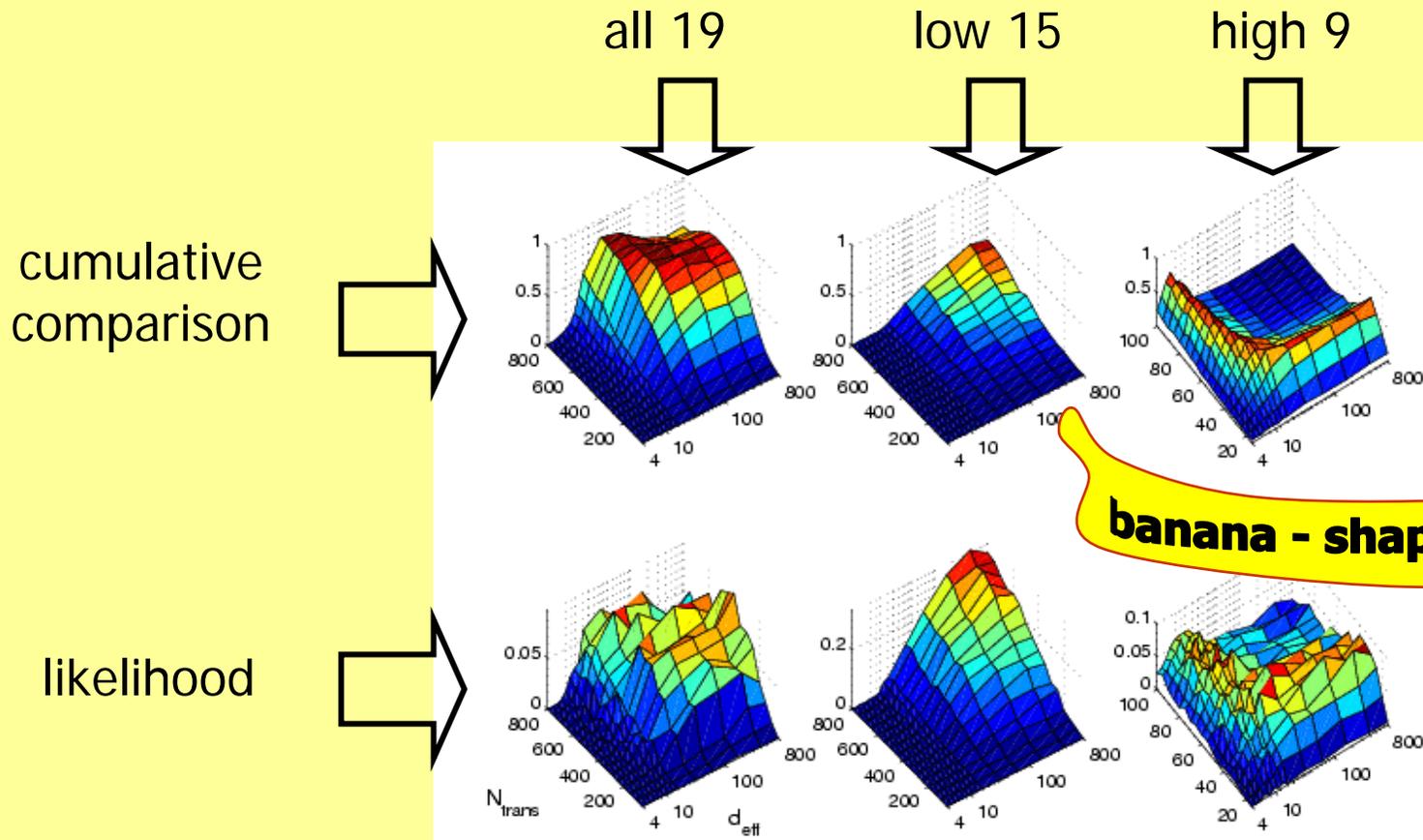
Experimental and calculated cumulative distributions

cumulative distributions –
experimental and calculated with
averaging over many simulations

Cumulative comparison: how well
are simulations in accord with
experimental strengths?



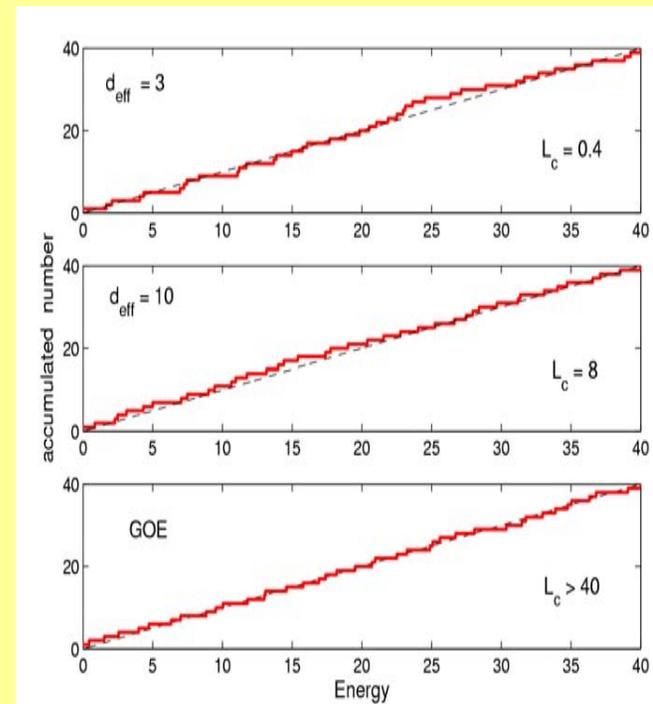
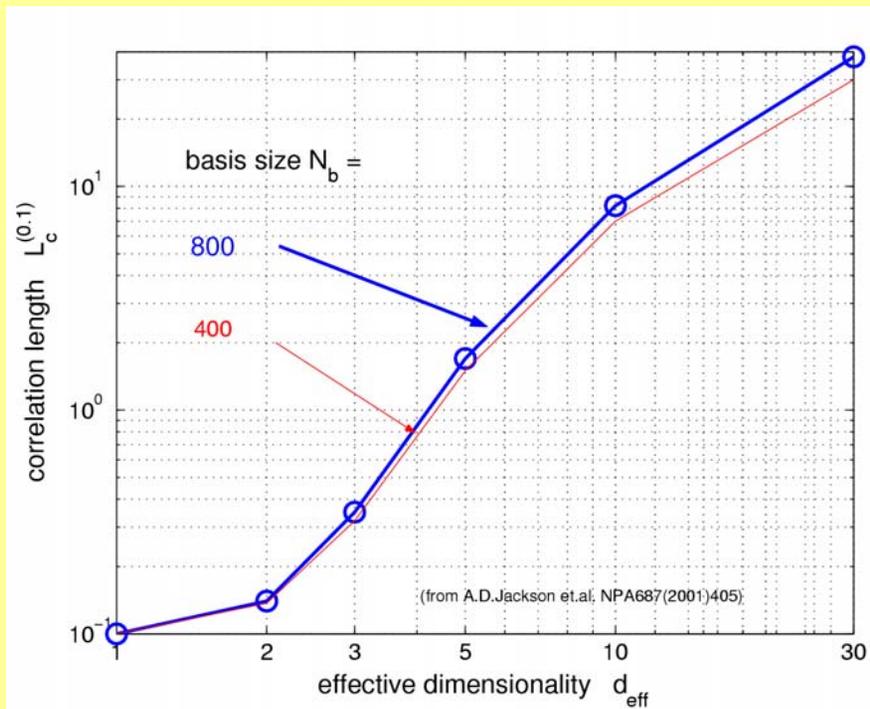
Cumulative comparison and likelihood



Spectral rigidity (d_{eff})

correlation length (d_{eff})

examples



Final result

^{194}Hg	from likelihood:			from fluctuation analysis:
	N_{trans}	d_{eff}	L_C	N_{trans}
all 19, $E_\gamma > 2600$ keV	> 250	> 14	> 10	530^{+250}_{-200}
low 15, $2600 < E_\gamma < 3400$ keV	> 400	> 30	> 25	500^{+250}_{-200}
high 9, $E_\gamma > 3400$ keV	30^{+10}_{-10}	> 8	> 2	30^{+20}_{-15}
	~ 70	5^{+2}_{-2}	~ 0.5	

Other nuclei

		N_{visib}	$N_{\text{trans,GOE}}$
^{192}Hg	not linked E1?	5	100^{+100}_{-50}
^{194}Pb	linked E1, M1	6,3	12^{+}_6
^{236}U	linked E1	5	6^{+}_1
^{59}Cu	Linked E2	5	18^{+}_8

- reasonable level density in all cases
- all display "bannas"

Checking the technique of likelihood with sparse matrices:

- ^{196}Pt n-resonances, 66 lines: (a) $N_{\text{trans}} \rightarrow 70$, $L_C > 8$,
(b) bananas disappear for $N_{\text{visib}} > 40$
- Simulations with basis size 800:
bananas disappear when $N_{\text{visib}} > 100$

Probes of order vs. chaos of individual states in heavy nuclei

