Comment on “Intermittent responses at mesoscopic scales” by H. Yoshino

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A structural-glass-centered comment

1. Chaos and step response in mean-field

2. Rejuvenation, memory and intermittent effects

3. Doubts and questions
1 Chaos and step response in mean-field

2 Rejuvenation, memory and intermittent effects

3 Doubts and questions
Chaos
Interpretation of rejuvenation

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Chaos arises (in MF) because

1. pure states are marginal (and thus modified non-perturbatively by changes in \( h \) or \( T \)), or
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- F-RSB (mostly)
- 1-RSB
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In the model studied by Y-R, the second mechanism is at work.
Stepwise response

Stepwise response in field is not observed in models in thermodynamic limit.

YR show that if
- $T \sim T_S$, and
- $N$ is finite
the magnetization responds in steps (and susceptibility shows peaks).

$$\Delta m \sim h_w \sim h_s \sim \frac{1}{\sqrt{N}}$$
Magnetization is self-averaging, but not the susceptibilities.

However, $[\chi_1] = \partial[m]/\partial h$.

Expansion in powers of $\delta h$ valid only for $\delta h \sim O(1/\sqrt{N})$.

Needs $\Sigma \sim 0$.
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Rejuvenation: structural vs. spin glasses

structural glass (PMMA thin films)
temperature cycle
[Fukao and Sakamoto PRE05]

spin glass (CdCr$_{1.7}$In$_{0.3}$S$_4$)
field cycle
[Vincent et al. PRB95]

Effect is rather small in PMMA
Intermittent (mesoscopic) fluctuations

PVAc film [Vidal-Russel and Israeloff Nature00]

Note intermittence; many timescales
Memory effects: structural vs. spin glasses

Two temperature stops

PMMA [Bellon et al. EPJ02]

two spin-glasses
[Jonason et al. PRL98]
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Doubts

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- Assumes $T \sim T_K \rightarrow$ good for states...
- but bad for experiments!
- And of course the thermodynamic picture of supercooled liquids is far from settled...
Doubts

- Does this really apply to structural glasses?
- What is rejuvenation really about anyway?
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Stress cycle in the soft glassy rheology (SGR) model
[Warren and Rottler arXiv:0807.0819]
Doubts

- Does this really apply to structural glasses?
- What is rejuvenation really about anyway?
- What about dynamics? FDT?