Model: N-component field $\varphi(x,t)$

Model A dynamics:

- $$\partial_t \varphi(x,t) = -\Omega \frac{\delta \mathcal{H}[\varphi]}{\delta \varphi(x,t)} + \xi(x,t)$$

stochastic noise

O(N)
- $$\mathcal{H}[\varphi] = \int d^dx \left[\frac{1}{2}(\nabla\varphi)^2 + \frac{1}{2} r_0 \varphi^2 + \frac{1}{4!} g_0 \varphi^4 \right]$$

- $$\langle \xi(x,t)\, \xi(x',t') \rangle = 2\,\Omega\, \delta^{(d)}(x-x')\, \delta(t-t')$$

$$\Rightarrow \quad S[\varphi,\tilde\varphi] = \int_{t_0}^{\infty} dt \int d^dx \left[\tilde\varphi\, \partial_t \varphi + \Omega\, \tilde\varphi \frac{\delta \mathcal{H}}{\delta \varphi} - \tilde\varphi\, \Omega\, \tilde\varphi \right]$$

MSR '73
BJW '76

response field $\leftrightarrow$ h

$$\langle O \rangle = \frac{\int [d\varphi\, d\tilde\varphi]\; O\; e^{-S[\varphi,\tilde\varphi]}}{\int [d\varphi\, d\tilde\varphi]\; e^{-S[\varphi,\tilde\varphi]}}$$

thermal noise

- $\varphi_0(x) \equiv \varphi(x, t=0)$ Initial condition with functional weight

$e^{-H_0[\varphi_0]}$ where: $H_0[\varphi_0] = \int d^dx \, \frac{\tau_0}{2} \left[\varphi_0(x) - a(x) \right]^2$

$\tau_0^{-1} \propto$ width around

τ_0^{-1} IRREL. – RG

$\Rightarrow$ Dynamics + initial conditions:

$\exp\{ -S[\varphi,\tilde\varphi] - H_0[\varphi_0] \}$ $\rightsquigarrow$ standard FT

$t_0 = 0$

JSS '88