Either use a convolution field as described or require that $\sup_t |Z(t)|$ where Z a Gaussian process has a continuous pdf.

Prof that this suffices.

Well, for each t, have $t, t' \in$,

have $X(t') \mid X(t)$ Gaussian.

$\Rightarrow$ if $p\left(\sup_{t'} X(t') \mid X(t)\right)$ (1) } issue here is that $X(t') \mid X(t)$ degenerate at $t=t'$

$= p\left(\sup_{t'} (X(t') \mid X(t))\right)$

p: pdf

then follows that (1) is cts,

and so $p(\sup_{t'} X(t'), X(t))$ is cts.

but may be able to exclude a ball around to form the sup?

need this so can apply LCT to $\sup_t X(t') \mid X(t)$ within the KR integral.

but lots of issues to sort out here!