Inversion of the Attenuated X-ray Transform by Continuous Wavelet Transform

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The attenuated x-ray transform arises from the image reconstruction process in single photon emission computed tomography (SPECT). As a special case (after some simplification with constant attenuation), the theory of the exponential xray transform is far more complete than that of the attenuated x-ray transform with spatially varying attenuation. Few exact inversion formulas in the later case were found in bibliographies, and a remarkable form is due to Novikov published in 2002. But Novikov's formula, and other known ones, make use in some way of complex-variable method, and need some stronger assumptions on smoothness and decay speed at infinity of both the attenuation function and the density function. In this talk we shall present several inversion formulas for general attenuated x-ray transform by means of continuous wavelet transforms. The highlight is to introduce some admissible conditions connecting the attenuation function and the wavelet function; the inversion formulas does hold for density functions in L^p both in norm and almost everywhere; and moreover we only need an assumption on integrability of the attenuation function and need not those on smoothness and decay speed. This is a joint work with Dr. Yufeng Yu.