Processes with many lines

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Time–frequency analysis is, by definition, concerned with the analysis of non–stationary processes. Thus it is wise to heed Tukey's caution "There have been requests for tools adequate to deal with non–stationary processes. ... there ought to be tools which would reveal to us all about a non–stationary situation, exactly and without thought. ... this seems a vain hope."

In this talk I review some recent developments in multitaper analysis of processes consisting of a dense set of periodic, or almost periodic components. Such processes appear to be ubiquitous in geophysical data and, because there statistics are perverse, these processes are commonly misclassified as non–stationary. Analyzing these approximately stationary processes on the assumption that they are non–stationary can result in physically implausible results. This is illustrated by examples from space physics and hydrology.