1057-15-93 **V. Druskin*** (`druskin1@slb.com`), 1 Hampshire St., Cambridge, MA 02139, and **M. Zaslavsky** (`mzaslavsky@slb.com`), 1 Hampshire St., Cambridge, MA. *n convergence of Krylov subspace approximations of time-invariant dynamical systems.*

We extend the rational Krylov subspace algorithm from the computation of the action of the matrix exponential to the solution of stable dynamical systems

$$\tilde{A}\left(\frac{d}{dt}\right)u(t) = b(t),\ u|_{t<0} = 0, \qquad \tilde{A}\left(\frac{d}{dt}\right) = \sum_{i=0}^{m} A_i\left(\frac{d}{dt} + sI\right)^i,$$

where $m \in \mathbf{N} \cup \{\infty\}$, $A_i = A_i^* \in \mathbf{R}^{N\times N}$, $s \leq 0$, and $u(t), b(t) \in \mathbf{R}^N$, $b|_{t<0} = 0$ (not assuming that evolution of $b(t)$ is described by a low-dimensional subspace of $\mathbf{R}^N$). This approach is equivalent or closely related to some known model reduction algorithms such as the interpolatory projection method, SPRIM and SOAR. We show that the reduced equation is stable and derive an a priori error bound via rational approximation of the exponential on the boundary of the nonlinear numerical range of $\tilde{A}$. We also describe a simple and easily computable external bound of this numerical range. The obtained results are applied to the infinite order problem arising in the solution of the dispersive Maxwell's system. (Received January 12, 2010)