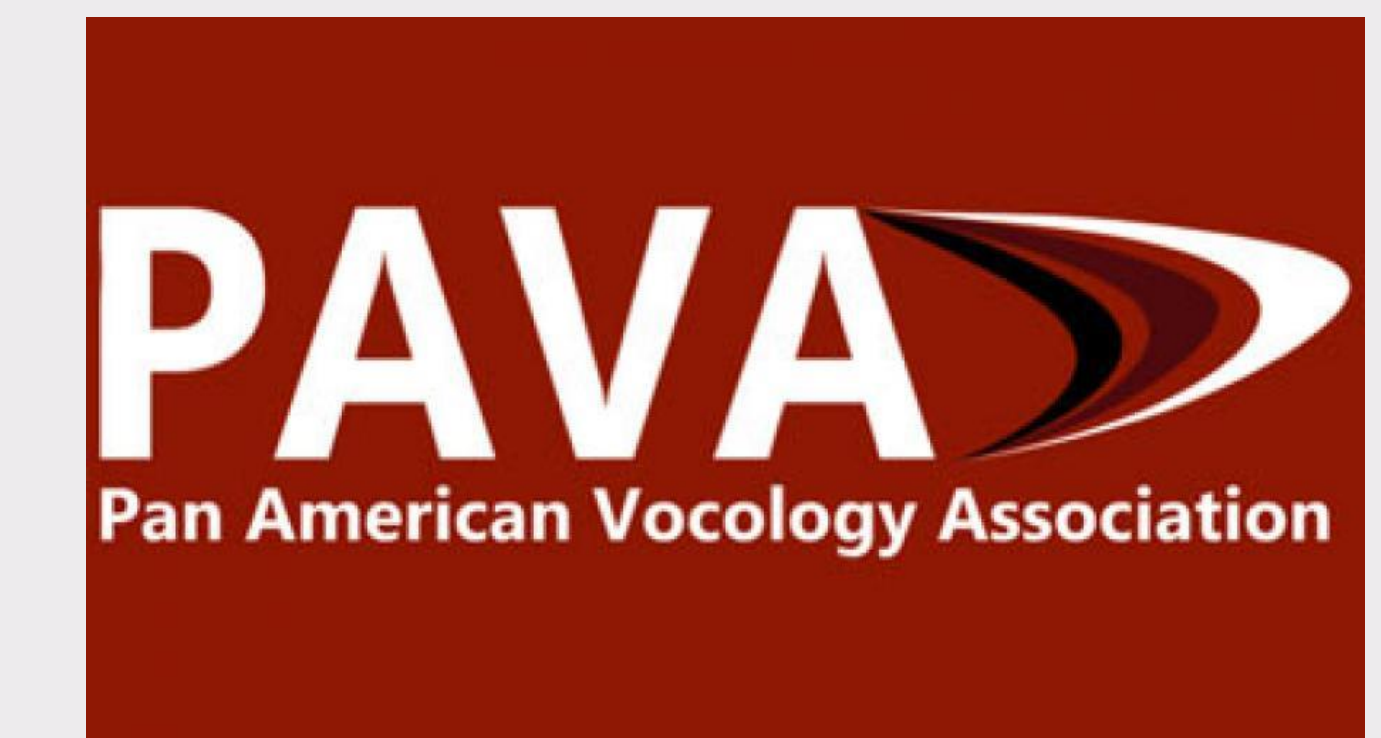




FLOATING IN THE STRATOSPHERE: SOPRANO RESONANCE STRATEGIES ON A SUSTAINED C6

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PURPOSE: To identify resonance strategies employed by world-class operatic sopranos sustaining a C6.

RESEARCH QUESTIONS

1. What acoustic resonance strategies are employed by world-class operatic sopranos singing a sustained C6?
2. Do singers change strategies from performance to performance or across decades?

METHOD & ANALYSIS

25 Commercial Recordings of 15 Sopranos with International Operatic Careers
Spectrogram and Long Term Average Spectrum Analysis in Voce Vista Video Pro Software

PERFORMANCES & SCORE

- Leontyne Price: [1960, 1968, 1982](#)
Renata Tebaldi: [1965](#)
Montserrat Caballé: [1969, 1970, 1975](#)
Renata Scotto: [1975](#)
Raina Kabaivanska: [1978](#)
Kiri Te Kanawa: [1985, 1990](#)
Edita Gruberova: [1998](#)
Ileana Cotrubas: [1998](#)
Mariella Devia: [1998, 2014, 2019](#)
Renee Fleming: [1999, 2003](#)
Ana María Martínez: [2005](#)
Angela Gheorghiu: [2006, 2009](#)
Nicole Cabell: [2007](#)
Pretty Yende: [2007](#)
Kristine Opolais: [2013](#)
Ailyn Pérez: [2020](#)



Excerpt of "Chi il bel sogno di Doretta" from Puccini's *La Rondine*.

Top staff: Soprano in treble clef. Bottom two staves: Piano reduction with grand staff, treble & bass clefs.

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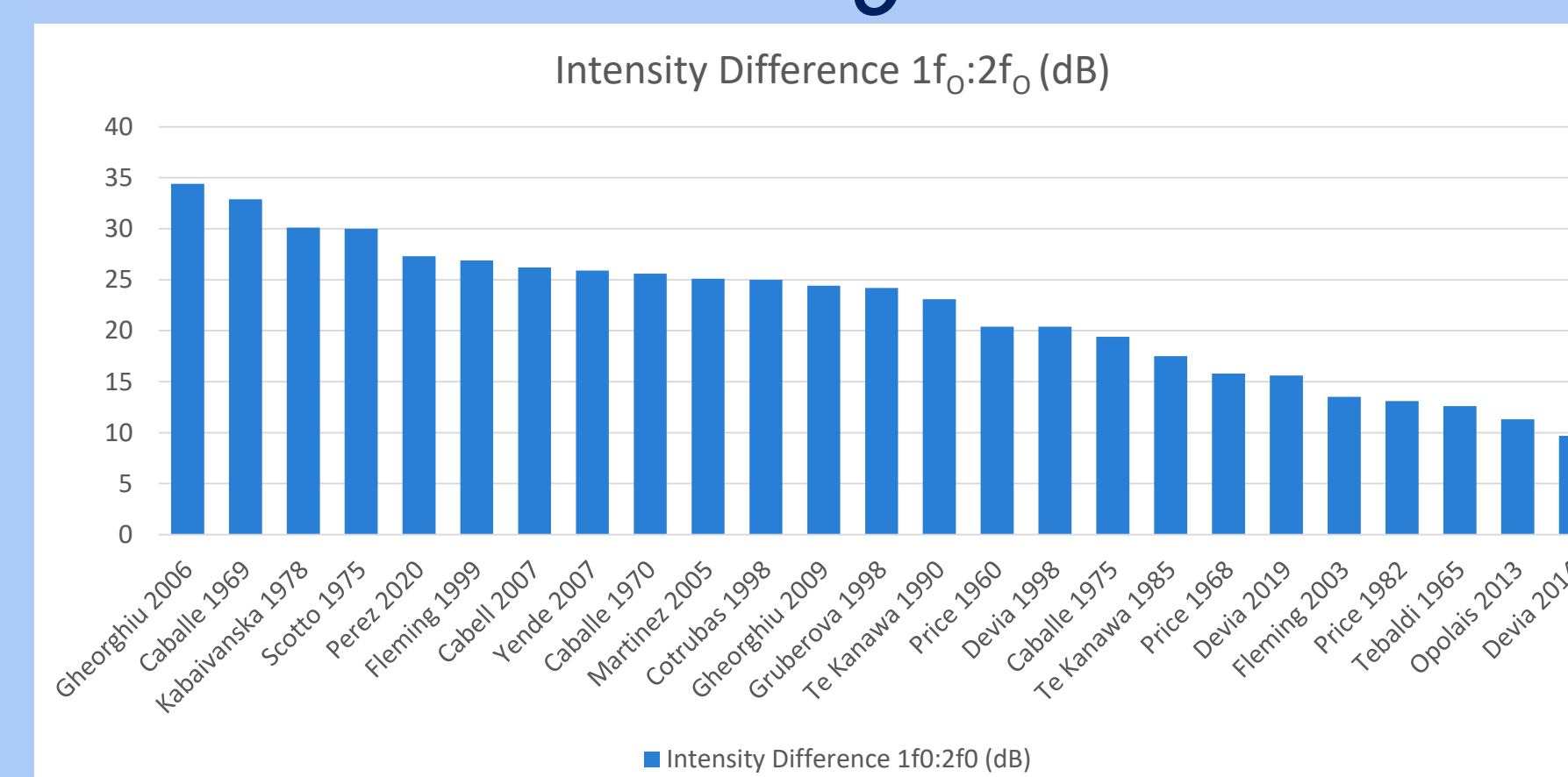
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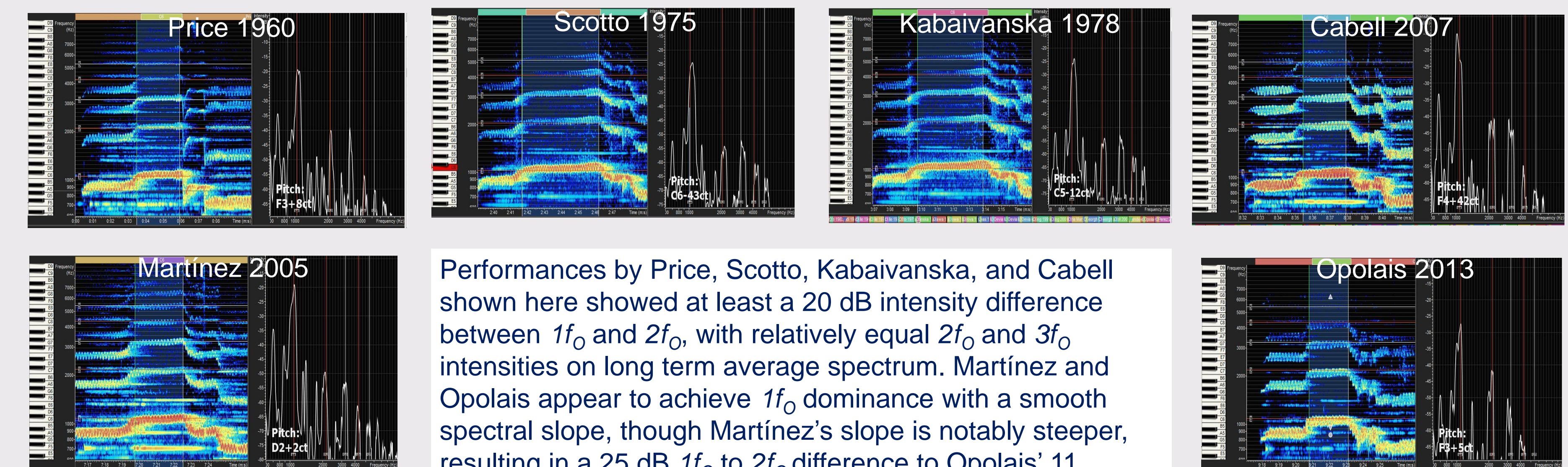
RESULTS & DISCUSSION

DEGREE OF $1f_0$ DOMINANCE



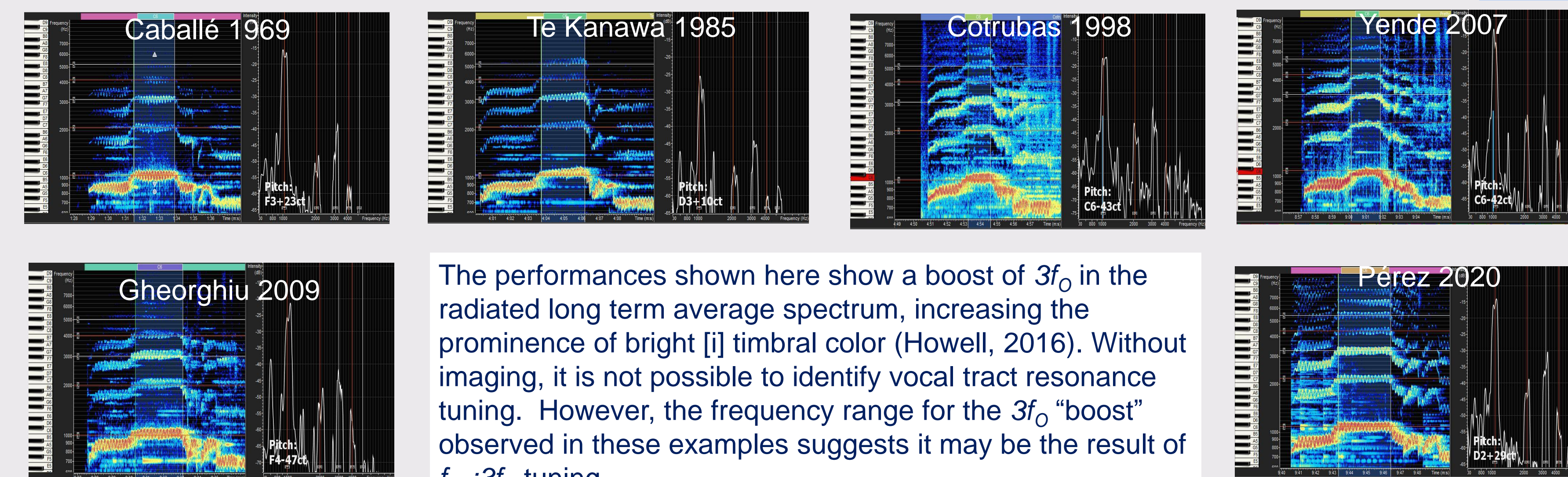
The frequency of oscillation, or $1f_0$ was the dominant harmonic for all singers. Nearly half had a difference of at least 20 dB between $1f_0$ and $2f_0$, suggesting either $f_{R1}:1f_0$ tuning (Garnier et. al. 2010) or possibly $f_{R2}:f_0$ tuning (Jeanneteau et. al. 2020).

"FLOATIER" OPTIONS: $1f_0$ DOMINANT STRATEGIES



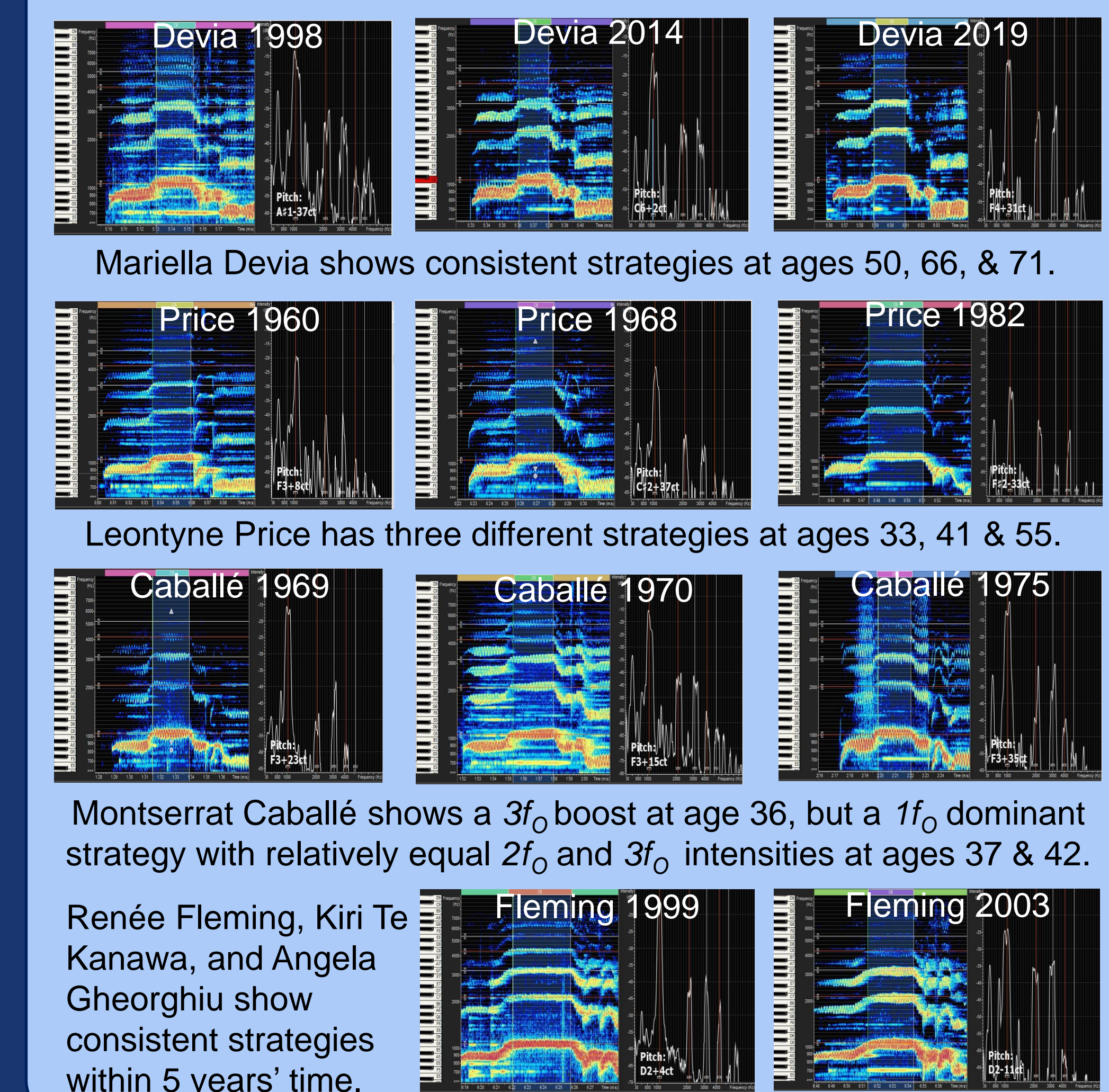
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A BRIGHTER OPTION: $1f_0$ DOMINANCE WITH $3f_0$ "BOOST"

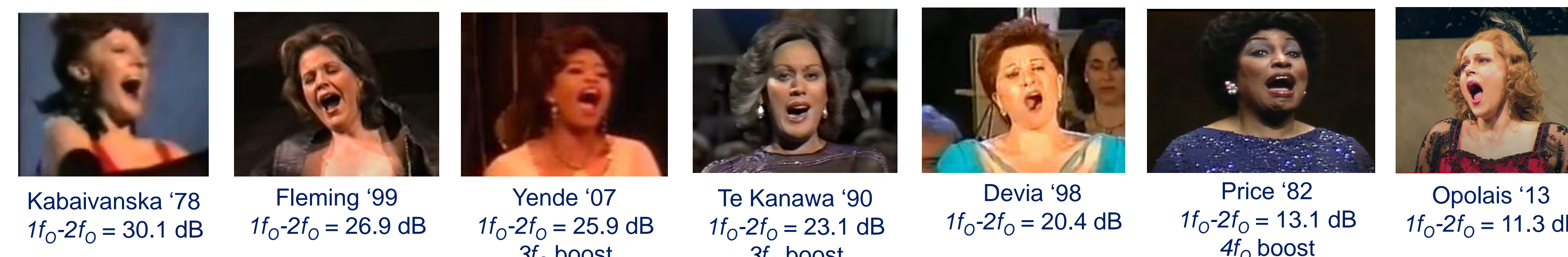


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CONSISTENCY OVER TIME



ARTICULATORY POSTURE ON C6



CONCLUSIONS & IMPLICATIONS FOR FUTURE RESEARCH

1. Acknowledging the limitations of commercial recordings, this analysis identified two successful resonance strategies employed by world-class sopranos when sustaining C6. Future research including imaging and controlled sound sampling could reveal more about the vocal tract resonances that result in these intensity differences within the first five harmonics of the radiated spectrum.
2. There does not appear to be an aesthetic trend in resonance strategies over time between 1960-2020, and though there are some exceptions, most of the international caliber performers studied were consistent in different performances – even across decades.