Filippov, Vanossi, and Urbakh Reply: We thank McLaughlin, Rabson, and Thiel [1] for their interest in our original work [2] and for their attentive reading.

Based on a 2D generalized Prandtl-Tomlinson model, the main conclusion of our Letter [2] is ''that the difference between the length scales of potential corrugation in the periodic and aperiodic directions is the main source of the observed anisotropy of friction on the Al-Ni-Co quasicrystal surface.'' The Prandtl-Tomlinson model demonstrates that the friction force along a given direction is mainly defined by the maximal gradient of the potential in that direction, which is dictated, besides the amplitudes of the substrate potential, by the length scales of potential corrugation. The length scales of potential corrugation depend, in turn, in a correlated way, on both lattice periodicity of the substrate and on the widths of the Gaussian functions used to mimic the potential. We do certainly agree with McLaughlin, Rabson, and Thiel that both these interrelated features are important, and their careful analysis highlights this issue.

Notwithstanding the theoretical interest of this ''parametric'' study, we did not play systematically in our work with the substrate parameters, since our aim was that of reproducing as close as possible the relevant features observed in the scanning-tunneling-microscope (STM) image of the twofold Al-Ni-Co surface. However, we performed a sort of gedanken experiment along the same line, considering a model ''quasicrystal potential'' which exhibits essentially identical length scales of potential corrugation along periodic and aperiodic directions and showing [Fig. 2(b) in Ref. [2]] that friction anisotropy turns to be negligible in this case.

The idea of our Letter was to show that the friction anisotropy of the quasicrystal surface can be explained based on topographic anisotropy, the most prominent features suggested by STM images [3]. The positions of the surface atoms map directly onto the positions of high tunneling probability in the STM image. These positions do not depend upon bias voltage, although their relative intensities do. The ''bumps'' in the STM image represent Al atoms on the twofold surface, where we have centered the Gaussian functions.

As correctly pointed out, in this case of a passivated probe (coated with insulating alkanethiol molecules) scanning the twofold Al-Ni-Co surface, the topographic profiles across the atomic rows indicate that the contrast depends on the bias voltage polarity, as shown by the STM empty and filled states images of the same area in Ref. [4]. Even if topographic heights are certainly different for these two recorded STM images, profile shapes and, hence, substrate corrugation length scales (arranged in Fibonacci sequence) look pretty similar. Thus, even if in this case the topography felt by an atomic force microscope would correspond more to that of a high negative bias voltage STM image (probing the filled states and not the empty ones), we do not expect a change in the frictional anisotropy trend along the periodic and aperiodic scanning directions.

As we already noted in our Letter, additional interesting contributions to the friction anisotropy, not accounted for in our model, may come from a difference in phonon dissipation along the aperiodic and periodic axes (where the dispersion bands might show energy gaps due to the Fibonacci sequence of distances and masses); electronic effects may also play a role.

Following the observations by McLaughlin, Rabson, and Thiel, we carefully reviewed our simulation algorithm and found that there was a material error in the scaling coefficient used to transform dimensionless quantities to dimensional ones.

The simulations were performed by approximating the tip-surface potential by a sum of anisotropic Gaussians:

$$G_{kk'}(x, y) = U_0 \exp[-(x - X_k)^2/w_1^2 - (y - Y_{k'})^2/w_2^2].$$

The results presented in Figs. 1, 2(a), and 3–5 of our Letter [2] correspond to the values of the widths $w_1 = 0.4$ nm and $w_2 = 0.16$ nm, while results in Fig. 2(b) were calculated for $w_1 = w_2 = 0.16$ nm. In addition, the values of parameters U_0 and T in the caption of Fig. 2 should be changed to $U_0 = -2.4 \times 10^{-19}$ J and $T = 43$ K, and all forces and velocities multiplied by a factor of 9.4×10^{-3} and 11.3, respectively. With these corrections, all results presented in our Letter and all conclusions remain unchanged.

We conclude that the comment by McLaughlin, Rabson, and Thiel is surely correct in its physical bases; moreover, it has been very useful in helping us rectify a material error in units conversion. However, we stand by our conclusion that there is no clear need to invoke any other effects than topographic anisotropy in order to explain qualitative features of friction anisotropy that naturally arises due to a difference in the length scales of potential corrugation in the periodic and aperiodic directions.

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