ZBF in 5 minutes

Zero Bad Frame — The end of waste in planetary imaging

The problem: 90% of your images end up in the trash

For 20 years, amateur planetary imaging has relied on **lucky imaging**:

- Capture thousands of frames (e.g., 10,000)
- Analyze the quality of each frame
- Keep only the "best" 10% (1,000)
- Stack these selected frames

The problem? **You discard 90% of the collected light signal.** It's as if you photographed for 2 minutes but only used 12 seconds of data.

The solution: ZBF — Use 100% of frames

ZBF = Zero Bad Frame

The principle is simple: *there is no bad frame, only poorly processed frames.*

Instead of selecting "good" images, ZBF corrects all images:

Approach	Frames captured	Frames used	Signal exploited
Lucky imaging	10,000	1,000	10%
ZBF	6,000	6,000	100%

The three pillars of ZBF

1. Zero Bad Frame — 100% of the signal

All frames are exploited. No sorting, no selection, no waste.

2. Zero Artifact — Natural rendering

No over-sharpening, no "plastic" effect, no halos. The image remains photographic, as if you were looking through the eyepiece with perfect seeing.

3. Ground Truth-like — Fidelity to reality

Details and colors converge toward ground truth:

- **Details**: what appears on the image actually exists on the planet
- **Colors**: natural tones, no artificial saturation
- **Validation**: structures follow planetary rotation between frames (physical proof)

The results

What ZBF allows you to see

- **Resolved planetary poles** — structures visible up to the geometric limb
- **Fine atmospheric details** — festoons, barges, ovals
- **Faithful colors** — tones correspond to physical reality
- **Consistent quality** — no "failed" session due to seeing

Animation reveals the truth

Over 200-300 frames in rotation, **ZBF shows perfect temporal coherence**. Structures evolve naturally as the planet rotates. Lucky imaging produces a "flickering" of artifacts — details that appear and disappear depending on the selected frames.

Diameter vs method comparison

Setup	Method	South pole result
400mm telescope	Lucky imaging	Limited
C11 280mm	ZBF	Resolved

A smaller telescope with ZBF can outperform a larger aperture with traditional method. Verify for yourself with the ZBF Challenge!

Why it works?

Seeing is not random

Lucky imaging assumes that seeing produces "good" and "bad" frames randomly. Keep the good ones, discard the bad ones.

ZBF starts from a different observation: **seeing deforms images in a measurable and correctable way**. With enough signal and the right algorithms, this deformation can be reversed.

More signal = more details

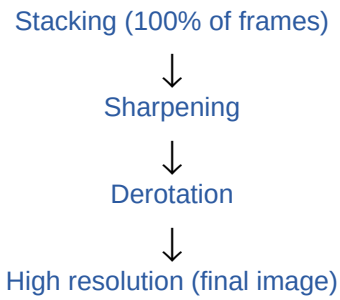
By using 100% of frames instead of 10%, ZBF collects **10× more signal**. This additional signal allows:

- Weak details to emerge from noise
- Low-contrast areas (poles) to be resolved
- Temporal coherence to be maintained
- Natural colors to be preserved

The pipeline

Jupiter acquisition (30 seconds)

- **ASI290MC**: 7500 frames @ 252fps
- **ASI462MC**: 6000 frames @ 203fps
- **ASI715MC**: 3840 frames @ 128fps
- **ASI178MC**: 840 frames @ 28fps



Processing time: 30 seconds per image on standard GPU.

Without AutoStakkert, without wavelets, without gimmicks.

FAQ

Q: Does it work with what equipment?

A: Tested with C11, C5, and ASI cameras. No specific equipment required.

Q: Does it take longer to process?

A: No. 30 seconds for the complete pipeline.

Q: Does it work in bad seeing?

A: Yes! That's where ZBF shows its superiority. No lost session.

Q: What minimum camera?

A: ZBF works with different frame rates. Even at 28fps (ASI178MC), 840 frames in 30s are sufficient for effective atmospheric correction. No need for ultra-fast camera.

Q: How to know if details are real?

A: Structures follow the planet's rotation between successive frames. This is physical proof that it's not a processing artifact.

Q: Are colors reliable?

A: Yes. ZBF preserves natural tones without artificial saturation. Spectral validation confirms colorimetric fidelity.

■ ZBF Challenge 2026

Want to test it yourself?

Participate in the ZBF Challenge:

- Compare your lucky imaging vs ZBF results on the same data
- Publish your comparisons on Facebook, forums, blogs
- Share your experience with the community

The challenge: Prove that lucky imaging does better than ZBF. Or see the difference.

All participants can publish their comparative results on the internet!

www.gpu-vision.fr/zbf_challenge.html

Summary

	Lucky Imaging	ZBF
Signal	Discards 90% of signal	Uses 100%
Seeing	Depends on seeing	Corrects seeing
Results	Need luck	Consistent results
Rendering	Frequent artifacts	Natural rendering
Colors	Saturated colors	Ground truth
Equipment	Bigger telescope = better	Method > aperture

ZBF: Stop discarding your photons.

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